This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

THE

POPULAR ENCYCLOPEDIA;

OR,

CONVERSATIONS LEXICON.

THE

POPULAR ENCYCLOPEDIA;

OR,

CONVERSATIONS LEXICON.

BEING

A DICTIONARY OF SCIENCE AND ARTS, LITERATURE, BIOGRAPHY, HISTORY, AND GENERAL INFORMATION.

EDITED BY

CHARLES ANNANDALE, M.A.,

EDITOR OF OGILVIE'S IMPERIAL DICTIONARY OF THE ENGLISH LANGUAGE, NEW EDITION

ILLUSTRATED WITH NUMEROUS ENGRAVINGS.

NEW AND REVISED EDITION, IN FOURTEEN VOLUMES.

VOL. IX.

MACLEOD—NEBUCHADNEZZAR.

LONDON:
BLACKIE & SON, OLD BAILEY, E.C.;
GLASGOW AND EDINBURGH.
1884.

GLASGOW:
W. G. [illegible], PRINTERS,
VILLAFIELD.

LIST OF ENGRAVINGS AND MAPS.

VOLUME IX.

PLATE		PAGE
	THE WORLD ON MERCATOR'S PROJECTION—Map, . .	76
CXXI.–CXXII.* . .	MARSUPIALIA, MONOTREMATA, EDENTATA—Kangaroo, Opossum, Wombat, Tasmanian Devil, Ornithorhynchus, Sloth, &c., ...	102
CXXIII.	MECHANICAL POWERS—Lever, Different forms of, Pulley, .	149
CXXIV.	Do. —Systems of Pulleys, Wheel and Axle, Inclined Plane, Wedge, Screw, &c.,	149
CXXV.	MEXICAN ANTIQUITIES—Native Architectural Remains in Yucatan, ...	205
CXXVI.	MINING—Sections of Coal Basin and Coal Strata, Mining Implements, Miners at Work, Shaft and Pumps, &c., . . .	247
CXXVII.	Do. —Sections and Workings of Metalliferous Mines, Cornish Man-Engine, &c., ...	247
CXXVIII.–CXXIX. .	MOLLUSCA AND SCOLECIDA—Cuttle-fish, Argonaut, Nautilus, Ammonite, Snail, Tapeworm, &c.,	294
CXXX.-CXXXI. . .	MOLLUSCA AND ECHINODERMATA—Ship-worm, Cockle, Oyster, Mussel, Scallop, Ascidian, Sea-Cucumber, &c., ...	295
CXXXII.	MOSQUE—Mosque of El Moayed, Cairo (in colour), ...	350
CXXXIII.	MUSKET—Martini-Henry Rifle and Ammunition, Mortar, Shell, &c., ...	392

THE

POPULAR ENCYCLOPEDIA;

OR,

CONVERSATIONS LEXICON.

MACLEOD, NORMAN, a minister of the Church of Scotland, born at Campbeltown, in Argyleshire, June 3, 1812; died at Glasgow, June 16, 1872. He was educated partly at the University of Glasgow, after leaving which he spent some time at a German university, and finally completed his course at the University of Edinburgh, where he came under the influence of the foremost man then in Scotland, Dr. Chalmers. Almost immediately after being licensed he was presented to the parish of Loudon, where he was ordained by the Presbytery of Irvine in 1838. Here he continued to perform the duties of pastor for about five years, when the secession of the Free Church from the Establishment took place, and in the many changes consequent thereupon Norman Macleod was presented by the Duke of Buccleuch to the charge of Dalkeith. It was while minister here that he first began to attract the notice of the church and the public; and here in 1847 he made his first adventure in literature, by the publication of Memorials of his friend John Macintosh, under the title The Earnest Student. About this time, too, he became the editor of the Edinburgh Christian Magazine, which he conducted for ten years. In 1850 he was intrusted by the General Assembly with a mission to Canada on the affairs of the church, which he conducted with success. On his return the Barony parish, Glasgow, in the gift of the crown, became vacant, and he, with the unanimous consent of the people, was inducted into the charge, one of the most influential in Scotland, in 1851. From this time his fame as a preacher gradually increased, and the Barony church was every Sunday filled to overflowing by crowds eager to hear him speak. In October, 1854, he preached before the queen by her special command in the parish church of Crathie. Further marks of royal favour soon flowed in upon him; he was appointed one of the deans of the chapel royal, Holyrood, and became one of the queen's chaplains for Scotland, and dean of the order of the Thistle. In 1858 he received the honorary degree of D.D. Henceforth his life seems to have been one continuous series of labours. Not content with the arduous duties of his large and populous parish, which he performed with an efficiency and zeal that has been seldom equalled, he threw his whole soul also into the general work of the church. Not that he took any leading position in party politics in the church; for that both by inclination, and perhaps by ability, he was altogether unsuited. But in all her schemes of public usefulness, all her efforts to elevate and Christianize the masses at home or the heathen abroad, he ever took the warmest interest. Especially as convener of the Foreign Mission Scheme he showed how willing he was to labour for any truly noble object. Year after year he travelled through the country, everywhere addressing meetings, and seeking to infuse into others some of the enthusiasm that burned within himself. On all matters pertaining to Christian life, every scheme that aimed at improving the social or moral condition of the working poor, no one could speak with more eloquence than he, and no one was ever listened to with more rapt attention. Nor all this time was his pen idle, as is shown by the large number of works published under his name, including sermons, lectures, addresses, devotional works, treatises on practical subjects, tales, travels, children's songs and stories, all bearing the impress of his warm heart and enthusiastic nature. In 1860 Good Words was begun, a magazine which he continued to edit till his death; and every volume of it was enriched with many articles from his own pen. But it is to his tales that he chiefly owes his position in literature: The Old Lieutenant and His Son; The Starling, a Scotch story; Wee Davie, a charming little study of humble life; and the Reminiscences of a Highland Parish, in which he gives a picture of life in the parish of Morven, in the Presbytery of Mull, where his father was minister. These, which appeared originally in the pages of Good Words, were afterwards published separately in London. In 1867 he was commissioned by the General Assembly, along with his friend Rev. Dr. Watson, of Dundee, to visit the mission-field of the church in India. His Peeps at the Far East are a memorial of this visit; but from the shock which his system received from the fatigues of the journey and the climate he never quite recovered. In May, 1869, was conferred upon him by acclamation the last honour which he lived to receive, that of being elected to the moderator's chair in the General Assembly. A life of Norman Macleod, by his brother the Rev. Donald Macleod, was published in 1876.

MACLISE, DANIEL, a celebrated painter of Scottish descent, born at Cork, January 25, 1811; died April 25, 1870. At an early age he manifested a taste for drawing, and desired to become an artist. His wish was at first overruled by his parents, who deemed an artist's career too precarious, and accordingly placed him in a situation in a banking-house at Cork. But he was soon freed from this irksome and uncongenial employment, and in 1828, at the age of seventeen, came to London to study at the Royal Academy. Before this he had not only assiduously practised himself in drawing, but had also been a diligent student of anatomy, and the knowledge which he gained by these studies was of great value to him in after life, in giving him a complete mastery of the human figure in all its attitudes. His career at the Academy was remarkably successful.

In his first year he won the medal for the antique, and he subsequently gained the medal for the best copy of a picture, and still later the gold medal for the best historical composition. His last success entitled him to the travelling-studentship of the academy, which would have enabled him to study three years in Italy had he wished to do so; but he preferred to remain in England. He had previously spent a summer (that of 1830) in studying at the Louvre and the Luxembourg at Paris. From 1830 to 1838 he contributed a series of character portraits to Fraser's Magazine, to accompany a text written by Dr. Maginn. He had now also become a regular contributor (of portraits and original pictures) to the exhibition of the Royal Academy, where his first picture, Malvolio Affecting the Count, a subject afterwards treated by him in another picture, was exhibited in 1829. Among these early compositions may be mentioned All Hallow Eve (1833), one of his best productions; Mokanna Unveiling, exhibited at the British Institution in the same year; Vow of the Ladies and the Peacock (1835); and Banquet Scene in Macbeth (1840), another admirable work, and one which has become popular by means of engravings and lithographs. In the year in which this last picture was exhibited he was elected a member of the Royal Academy, having previously, in 1835, been admitted an associate. Subsequently to this he exhibited The Sleeping Beauty (1841); Play Scene in Hamlet (1842), now in the National Gallery; Shakspere's Seven Ages (1848); The Interview between Peter the Great and William III. (1857). In 1857 he also exhibited a fine series of designs, entitled Story of the Norman Conquest, afterwards published by the Art Union of London. About this time he was requested to decorate the interior of the royal gallery in the Westminster Palace with frescoes, which he finally consented to do, although not till after the request had been often and urgently repeated. Being dissatisfied with the frescoes which had previously been executed on the walls of the Houses of Parliament and elsewhere, he determined before beginning his own works to examine the early frescoes of Italy, and to make himself thoroughly acquainted with the process of water-glass painting introduced by Kaulbach in Germany. He therefore visited both these countries in 1859. His visit to Germany satisfied him of the value of Kaulbach's process, which he adopted for his own works in Westminster Palace. On his return to England he began to execute the task which he had undertaken, and he continued to apply himself to it without cessation till 1865, when the second of his two great pictures, The Meeting of Wellington and Blucher on the Evening of the Battle of Waterloo, and the Death of Nelson at Trafalgar, was completed. Each of these pictures is 45 feet long and 12 feet high. Although they are considered to be the finest pictures of the kind ever executed in England, the labour which the artist bestowed upon them was very inadequately remunerated, and the pictures themselves were received with comparative neglect by the public, a circumstance which Maclise felt much more keenly. Maclise prepared other two designs for the same gallery, Alfred in the Danish Camp, and The Marriage of Strongbow and Eva; but they were never transferred to its walls. During the time that Maclise was engaged in this laborious task he remained unrepresented on the walls of the National Gallery. In 1866 he reappeared with a picture, bearing the title Here Nelson Fell, being the design for the great picture in the Royal Gallery. In 1867 he exhibited Othello, Desdemona, and Ophelia, and A Winter Night's Tale; in 1868, The Sleep of Duncan and Madeline after Prayer; and in 1869 King Cophetua and the Beggar Maid. The Earls of Desmond and Ormond was exhibited posthumously in 1870. Maclise was a remarkably facile painter. He attempted all styles, but succeeded best in semi-historical and familiar subjects. His pictures are remarkable for their excellent grouping (when not overcrowded), and for the expression and animation which he gives his figures.

MÂCON (Latin, *Matisco*), a town in France, department of the Saône-et-Loire, on the right bank of the Saône, here crossed by an old bridge of twelve arches, in a fertile district, 33 miles south of Châlons. It consists generally of narrow irregular streets, but has several handsome modern buildings, agreeable walks formed out of its ramparts, and a long and spacious quay. The principal edifices are the infirmary, hospital, town-house; prefecture, formerly a bishop's palace; college, and primary normal school. Its manufactures are woollen covers, casks, clocks, earthenware, agricultural and other implements; and its trade is in wine, corn, timber, &c. Pop. (1881), 19,567.

MACON, a city in the United States, Georgia, capital of Bibb county, 25 miles south-west of Milledgeville, chiefly on the right bank of the Ocmulgee, here crossed by a bridge 589 feet long. A great deal of cotton is shipped here. Steam-boats ply on the river. Pop. (1880), 12,749.

MACPHERSON, JAMES, distinguished in literary history for his translations or imitations of Gaelic poems, said to have been composed in the third century. He was born in Inverness-shire in 1738, and studied at Aberdeen and Edinburgh. Having published Fragments of Ancient Poetry, translated from the Gaelic or Erse Language, a subscription was raised to enable him to collect additional specimens of national poetry. He produced, as the fruit of his researches, Fingal, an Ancient Epic Poem, translated from the Gaelic (1762, 4to); Temora and other Poems (1763, 4to), professedly translated from originals by Ossian, the son of Fingal, a Gaelic prince of the third century, and his contemporaries. (For an account of the controversy on this subject see OSSIAN.) From the evidence of the contending parties it may be concluded that Macpherson's prose epics were founded on traditional narratives current among the Highlanders; but the date of the oldest of their lays is comparatively modern, and it is now difficult, if not impossible, to ascertain the precise extent of his obligations to the Gaelic bards of former ages. Macpherson was afterwards agent to the Nabob of Arcot, in consequence of which he had a seat in the House of Commons from 1780 to 1790. He died in 1796, and was interred in Westminster Abbey. He was also the author of a prose translation of Homer's Iliad and of some other works.

MACREADY, WILLIAM CHARLES, a celebrated English tragedian, born in London, March 3, 1793; died at Cheltenham in April, 1873. His father was the lessee and manager of several provincial theatres, but was not on that account desirous that his son should follow an actor's life, for which Macready himself had originally no taste. Macready accordingly, after receiving his preliminary education at Rugby, went to Oxford with the intention of adopting one of the learned professions. The change in his career was brought about by his father having fallen into embarrassed circumstances, to relieve which he joined his father's troupe, then acting at Birmingham. He appeared there for the first time in 1810 in the character of Romeo, in which he was decidedly successful. He continued with his father's troupe till the Christmas of 1814, performing with uniform success in the chief towns of the provinces. At the date mentioned he started on an independent

tour, and acted, among other places, at Edinburgh, Glasgow, Dublin, and Bath. On the 15th of September, 1816, he made his first appearance on the London boards, acting Orestes in The Distressed Mother at Covent Garden Theatre. He did not achieve an immediate triumph in London, but gradually rose in popular favour, not, however, in Shaksperian characters, which were then preoccupied by Charles Kemble, Young, and Edmund Kean, but in such characters as Gambia in The Slave and Virginius in Sheridan Knowles' tragedy of that name. His Virginius was perhaps the greatest of his early London successes. From the time when he appeared in this part he continued steadily to improve as an actor, and his successes were no longer confined to the lower walks of the profession. The characters in which he succeeded best were those of a severe type. Iago has been considered by some his best impersonation, though it was never his most popular one. In 1826 he visited America, and in 1828 Paris, and on both occasions received an enthusiastic reception. In 1837 he undertook the management of the Covent Garden Theatre, and in this capacity, which he retained for two seasons, laboured incessantly to reform the stage, both in respect of its morals and in respect of the artistic qualities of the representations. His efforts were not, however, pecuniarily successful, which was the cause of his resigning the managership so soon. In 1842 he again became a theatre manager, this time at Drury Lane, but met with no better success on this occasion than on the first, so that he again resigned at the end of the second season. His managership at Drury Lane had not only been unprofitable, but had brought upon him considerable loss, to repair which he again visited America in 1849. On his return to London he gave some farewell performances, by which he added considerably to his resources, and then retired from the stage in 1851. He lived during the remainder of his life first at Sherborne, afterwards at Cheltenham.

M'CRIE, THOMAS, an eminent historian and biographer, born at Dunse in November, 1772. Having in early life shown a decided taste for study, he escaped the mercantile employment to which his parents had apparently destined him, and at the age of sixteen entered the Edinburgh University to prepare for the ministry among the Antiburghers. In 1795, within two months after being licensed as a preacher, he received a call, and was in consequence settled as second minister to the congregation in Potter Row, Edinburgh. After he had ministered here for some time he became involved in a controversy concerning the power of the state in matters ecclesiastical. The original view of those who separated from the Established Church was not to dissolve their connection with it absolutely, but only to remain in a state of separation from it till the abuses and grievances of which they complained were removed. They accordingly regarded themselves not as Dissenters, but as Seceders. In course of time the distinction was lost sight of by a majority of the Secession body; and M'Crie, along with three other ministers who agreed with him in clinging to the original view, were formally deposed in 1806. Nothing daunted for suffering in what they believed to be a good cause, they formed themselves into the Constitutional Associate Presbytery, and were generally followed by their congregations, who erected new churches for them. This controversy and the principles involved in it added to the deep interest which M'Crie had always felt in the early progress of the Reformation both in Scotland and in other countries, and he had from 1802 to 1806 contributed a series of interesting articles on these subjects to the Christian Magazine. Having thus tried and ascertained his powers as a church historian and biographer, he wrote a Life of Knox, which was published in 1811. It was a great success, and called forth such a eulogy from Jeffrey in the Edinburgh Review as at once gave its author literary rank among the ablest writers and most independent thinkers of the day. This first work was followed in 1819 by the Life of Andrew Melville, which, though written with no less ability than the other, furnished fewer events of stirring interest, and therefore has not proved so popular. These are the works on which Dr. M'Crie's fame chiefly rests; but he wrote several others of great interest and value, among which may be mentioned The History of the Progress and Suppression of the Reformation in Italy (1827); The Progress and Suppression of the Reformation in Spain in the Sixteenth Century (1829); an elaborate review of the Waverley novel Old Mortality, contributed to the Christian Instructor, and afterwards published separately; and two volumes published posthumously, the one Sermons, and the other Lectures on the Book of Esther. Dr. M'Crie mingled little in politics, but was never backward, when the cause of religious and civil liberty seemed in danger, to aid it both by his pen and his appearance on the platform, where, notwithstanding a monotonous voice and an unanimated delivery, he never failed to make a powerful impression. He died at Edinburgh on the 5th of August, 1835.

MACROBIUS, AMBROSIUS AURELIUS THEODOSIUS, a Latin author in the reigns of the Emperors Honorius and Theodosius (end of fourth and beginning of fifth century A.D.) The country of his birth is uncertain, but it is inferred from the fact that he speaks of Latin as a foreign tongue to him, that he was probably a Greek. He was the author of a miscellaneous work entitled Saturnalia, curious for its criticisms, and valuable for the light it throws upon the manners and customs of antiquity; a commentary on Cicero's Somnium Scipionis, in two books, valuable for the exposition it affords of the doctrines of Pythagoras with respect to the harmony of the spheres; and a treatise, De Differentiis et Societatibus Græci Latinique Verbi. There are several editions of this author's writings, the best of which are those of Gronovius (1670, Leyden) and Zeunius (1774, Leipzig).

MACROOM, or MACROMP, a market town in Ireland, situated in a healthy open valley on the Sullane (a tributary of the Lee), in the county of Cork, and 24¾ miles W. by N. from Cork by rail. The chief buildings are the court-house, Protestant and Roman Catholic churches, National school, dispensary, &c. The principal trade is in butter (for export), corn, and the purchase of pigs for the Cork market. Macroom Castle was the birth-place of Admiral Sir William Penn, father of the founder of Pennsylvania. Pop. in 1881, 3099.

MACROPUS (Greek *makros*, long; *pous*, foot), the generic name of the kangaroos, applied to them in allusion to their elongated hind feet. See KANGAROO and MARSUPIALIA.

MACROTHERIUM, a large extinct mammal belonging to the order Edentata, which is now represented by such familiar forms as the ant-eaters, sloths, and armadillos. The Macrotherium was of gigantic size, and forms one of the oldest of the edentate fossils which are known to geologists and palæontologists. Unlike the other, and as characteristic fossil-forms belonging to this group, and which are found in the post-tertiary or recent formations of South America, the Macrotherium remains are found in France, and in deposits of miocene age. This exception in the locality, and also in the age of this form, renders it somewhat remarkable. Its zoological position would appear to have been intermediate between the pan-

golins or scaly ant-eaters of Africa and Asia, and the 'Aard ark' or ground-hog of South Africa.

MACRURA (Greek *makros*, long, *oura*, tail), a division of the Decapoda or highest order of Crustaceans, including the Lobsters, Crawfishes, Shrimps, Prawns, &c. which see. The distinctive term Macrura has been applied to denote this tribe of Decapodous Crustaceans, from the presence of a perfect and elongated abdomen or tail, well seen in the animals above noted. This tail is frequently longer than the front portion of the body, and its hinder segments are generally modified to form a fin-like organ, by means of which, as well seen in the lobster, these creatures can propel themselves forcibly backwards in the water. The familiar crabs, in which the abdomen is undeveloped and forms a mere appendage tucked in under the broadened front portion of the body, are in contradistinction known as the *Brachyura* or 'Short-tailed' Crustaceans. See also CRUSTACEA.

MADAGASCAR, a large island in the Indian Ocean, 250 miles distant from the nearest point of the south-east coast of Africa. Its length from Cape Amber in the north to Cape St. Mary in the south is 975 miles; average breadth, 250 miles; area, about 228,500 square miles; population, about 3,500,000. Madagascar may be described in general terms as consisting of an elevated region with an average height of from 3000 to 5000 feet overlooked by mountains rising in some cases to nearly 9000 feet above the sea-level. This plateau, however, occupies a much larger proportion of the surface in the north and east than in the west and south, and the greater portion of the island south of latitude 23° S. belongs to a much lower region. But this low region does not consist entirely of plains, as it is interrupted towards the west by three prominent chains of hills stretching from north to south, one of them apparently in a continuous line about 600 miles in length. Geologically the elevated region consists almost entirely of granite and other igneous rocks, while the lower region is composed chiefly of secondary formations. The former region is traversed by a line of extinct volcanic craters, some of which show signs of comparatively recent activity. Among the more remarkable fossils of the sedimentary strata are remains of the hippopotamus, those of gigantic tortoises, and of a huge struthious bird, scientifically known as the Æpyornis, whose egg, measuring 12 by 9 inches, is larger than that of any other known bird.

Rivers, Lakes, Lagoons.—The rivers are exceedingly numerous, yet few of them offer even to a moderate extent the advantages of internal navigation. As may be inferred from the conformation of the interior the chief rivers have their courses on the west and north-west sides of the island. The Betsibóka with its affluent the Ikiopa, unitedly measuring 300 miles, may be ascended by light steamers for 100 miles; the Tsiribihina has a somewhat shorter course, but drains by its numerous tributaries a much larger area. The eastern rivers descend from the high land through magnificent gorges, forming a succession of rapids and cascades, the falls in some instances having a descent of 500 feet. There are few lakes of any size as yet known to explorers; one of the largest is Alaotra Lake, measuring 25 miles long; the others do not reach a length of 10 miles. A long chain of lagoons having very short distances between each and often expanding into wide sheets of water stretches for nearly 300 miles along the east coast.

Climate.—The climate is various; the heat on the coast is often very intense, but on the high lands of interior the temperature is more moderate. On coast the rains are nearly constant, beginning in vening and sometimes lasting all night; in the interior the winter is dry and agreeable. The greatest amount of rainfall takes place on the east coast, and especially on the north-east the part directly exposed to the summer monsoon. The elevated region of the interior and the districts on the west coast are tolerably healthy for Europeans, but owing to the large extent of marsh and lagoon on the east malarial fever prevails, and is frequently fatal to natives from the interior as well as to Europeans. Snow is never found on even the highest mountains.

Vegetation.—The most striking feature in the vegetation is a belt of dense forest with an average breadth of 15 to 20 miles passing round the whole island, and broken only by a gap in the north-west where the two ends of the forest overlap. It is found at all levels from 6000 feet to the water's edge, which it touches on the north-east, where it reaches its greatest breadth of 40 miles. The trees of this forest include many species of lofty palms, hard-wooded exogens supplying a great variety of beautifully veined and durable timber, and a large number of trees remarkable for the splendid character of their blossoms. Of all the trees of Madagascar the most striking is the ravinala or traveller's-tree (*Urania speciosa*): it resembles a palm, its stem being crowned by a semicircle of oblong leaves spread out vertically in a fan shape. It owes its name to the fact that the traveller may supply himself with water from it by piercing or breaking the lower ends of the leaf-stalks. Of the vegetable products grown for food by far the most important is rice, the staple food of the inhabitants; next in importance come manioc or cassava, sweet-potatoes, beans, tomatoes, ground-nuts, and yams. Ginger, pepper, and indigo grow wild in the woods; cotton, sugar-cane, coffee, tobacco, and hemp are cultivated. India-rubber, gum-copal, and dye-woods are exported.

Zoology.—The mammals are almost throughout the entire list different not only specifically but generically from those of all other lands. No large quadrupeds—neither carnivorous, ungulate, nor proboscidean—are indigenous to the island. Humped cattle, it is true, are found in immense herds, and form a large part of the wealth of the inhabitants, but they appear to have been introduced from Africa at a remote period, as the fat-tailed sheep, goats, swine, and horses have been more recently. The most characteristic families of the mammals are the Lemuridæ (see LEMUR), the insectivorous Centetidæ (see TANREC), and, among the Carnivora, the Viverridæ or civet family. The singular animal called the aye-aye, closely allied to the lemurs, is peculiar to the island. The birds are numerous and poultry plentiful. Venomous snakes are rare, but two or three small species of boa are found. Crocodiles are numerous in the rivers and lakes, and many species of lizards, chameleons, and tree-frogs abound in the forests. Among the insects are numerous brilliantly-coloured beetles, butterflies, moths, flies, locusts, and spiders, venomous species of the latter as well as scorpions and centipedes being present.

People.—The inhabitants, known by the name of Malagasy, belong to the Malayo-Polynesian stock and speak a Malayan language. They appear to form substantially a single race, though they have received a considerable intermixture of African blood and a certain amount of Arab intermixture. They are divided into numerous tribes, each having a distinctive name and customs. The Hovas are the ruling tribe; their proper country is the elevated region of the interior, but they have extended their sway over nearly the whole island. Among the other chief tribes are the Betsimasaraka on the east coast, the Betsileo in the south central region, and the Sakalava on the west and north. The people are socially

divided into three classes: Andrians or nobles, Hovas (in a special and restricted use of the word) or free commoners, and Andevos or slaves. This last section consists, or till recently consisted, partly of debtors and criminals and their descendants, partly of Africans brought over in slave-dhows, and partly of the descendants of other tribes conquered by the Hovas. The Africans were, however, formally set free in 1877.—In the coast districts the houses of the better class are built of framed timber with lofty roofs covered with shingles or tiles; the dwellings of the lower classes are constructed of bamboo or rushes, or even of clay. In former and more unsettled times the villages were almost always built on the tops of hills, but during the present century this precaution has not been deemed so indispensable. In general the Malagasy show much aptitude for the manual arts. As silversmiths, gunsmiths, and carpenters they rapidly acquire the skill of Europeans; and with looms of the rudest construction they make excellent and handsome cloths. The principal article of dress with both sexes is the *lamba*, a piece of cloth about three yards long and two broad, which is folded round the body above the arms, one end being thrown over the shoulder.—The religion of the great bulk of the people is a kind of fetishism or worship of charms, and numerous gross superstitions are current among them. One of the most prevalent of these superstitions is the forbidding the performance of certain actions or the utterance of certain names; any action so forbidden is said to be *fady*. Formerly an accused person was in most cases subject to the ordeal of the tanguin, tanghin, or tangena, a poisonous nut which acts in small doses as an emetic. He swallowed three pieces of the skin of a fowl and then drank a broth containing tanghin; if he vomited the bits of skin he was considered innocent, otherwise he was condemned and executed at once. This practice was abolished in 1865. Of late years Christianity has made considerable progress, having been recognized by the government in 1862, and gained thousands of converts. Until lately polygamy was prevalent, but it has now become less common.

Government, &c.—The government is a monarchical despotism, but the authority of the sovereign becomes weaker the farther you are removed from the capital. Public assemblies are still called and addressed by, or in the name of the sovereign, but are not consulted. A body of unpaid judges sits constantly in public to hear complaints and settle disputes, but they are not guided by any written code. The state revenue is derived from customs-duties, first-fruits, fines, and confiscations of offenders' property, money offerings presented to the sovereign on many occasions, and taxes levied for occasional necessities. The capital is Antananarivo, near the centre of the island; the towns next in importance are Mojanga, a port on the west (pop. 14,000); and Tamatave, a port on the east (pop. 6000).

History.—Madagascar was known to the traveller Marco Polo at the end of the 13th century and has been visited for several centuries by the Arabs. In 1506 it was visited by the Portuguese, who gave it the name of St. Lorenzo. Towards the end of the 17th and during the most of the 18th century the French endeavoured to form military stations on the east coast, but with no lasting results. A settlement was established at Fort Dauphin in the south-east and held for some time, but in consequence of the tyrannical behaviour of the French settlers they were massacred by the natives, and the place destroyed. The French, however, struggled hard and successfully to retain the islands of Ste. Marie on the east coast and Nossi-bé on the north-west. Previous to 1810 Madagascar might be said to have been divided among numerous petty chiefs, almost constantly at war with each other. In that year, however, Radama I., a prince of remarkable intelligence, became king of the Hovas, and began to enforce a claim by right of conquest to the sovereignty of the whole island. He saw that if his people were to be prosperous they must first be educated and civilized. In return for the promise of co-operation in putting down the slave-trade on the coast of Mozambique, he received arms and other assistance from the British, by which he was enabled to carry on his conquests. Christian missionaries began to teach in the capital in 1820, many converts were made, the Bible was translated into the Malagasy tongue, the language was first reduced to a systematic written form, and printing was introduced. Great improvements had taken place in the manners of the people when Radama died in 1828, and was succeeded by his chief wife, Ranavalona, a woman of cruel disposition, and opposed to all innovation. The native converts were persecuted, many of them being put to death, and the island was closed to Europeans. This reign of terror ended at last in 1861, when the queen died and was succeeded by her son Radama II., who, himself a Christian, reopened the island to European missionaries and traders, abolished the tanghin ordeal, and proclaimed the emancipation of the African slaves. He appears, however, to have been a weak prince easily swayed by native and foreign favourites, and he unwisely granted extensive territories and privileges to an enterprising French company, an act which lost him the affection of his nobles, and led to his assassination in 1863. His wife Rasoherina was placed on the throne, and the government repudiated the concessions made to the French, offering a million francs as compensation. After a quiet and prosperous reign of five years this queen died, and was succeeded by Ranavalona II. in 1868. After she had been elected queen she and a great number of her courtiers became Christians, and many reforms favourable to enlightenment and humanity were perseveringly carried out. Unfortunately for the prosperity of the country, however, the French brought forward their claims on the Malagasy territory, which, being refused, led to the bombardment and capture of Majonga (May 18, 1883) and Tamatave (June 10). These hostile acts have not yet secured the recognition of the French claims. On the 13th July of this year the queen died, leaving the throne to her niece Ranavalona III.

For the most recent and valuable information regarding Madagascar and the Malagasy we are indebted chiefly to Dr. Mullen's Twelve Months in Madagascar (London, 1875); Rev. J. Sibree's The Great African Island (London, 1880); and A. Grandidier's Histoire Naturelle, Physique et Politique, now in course of publication, in twenty-eight vols. 4to.

MADAME, a title which, used absolutely and as a proper noun, was applied in France from the seventeenth century, sometimes to the eldest daughter of the king, but more especially to the wife of *Monsieur*, the eldest brother of the king. Sometimes *Madame royale* was used instead. As ordinarily used it is equivalent to our Madam, Ma'am, and Mrs.

MADDEN, Sir Frederick, a celebrated antiquarian, born at Portsmouth in 1801; died in London, March 8, 1873. He early gave himself up to antiquarian pursuits, and on the recommendation of Roscoe he was appointed to prepare a catalogue of manuscripts in the British Museum. In 1828 he was appointed assistant keeper of MSS. in the museum, and in 1837 head keeper. He had, previously to this last appointment, been made a knight of the Hanoverian Order by William IV. His published works are mostly annotated editions of early English

works, and are all distinguished by thoroughness of research and great accuracy. The most important are—The Ancient English Romance of Havelok the Dane, printed for the Roxburghe Club in 1828; William and the Werwolf, printed for the same club in 1832; The Old English Versions of the Gesta Romanorum, also printed for the Roxburghe Club (1838); Layamon's Brut, for the Society of Antiquaries (1847); Wycliffe's Version of the Bible, edited in conjunction with the Rev. J. Forshall and published at the Clarendon press in 1850; the English edition of Silvestre's Universal Palæography; or Facsimiles of Writings of all Periods and Nations (London, 1850); The Chronicle of Matthew of Paris (1853). He also supplied the descriptions to Shaw's Illuminated Ornaments, selected from manuscripts and early printed books from the sixth to the seventeenth centuries. In 1838 he contributed to the Archæologia an article entitled Observations on an Autograph of Shakspere, and the Orthography of his Name, in which he gives reasons for believing that the spelling adopted in the title of his article was the uniform spelling of the poet and his family.

MADDER (*Rubia tinctorum*), a plant belonging to the natural order Galiaceæ or Stellatæ, having square stems and verticillate leaves, with small flowers, usually disposed in terminal panicles. This order includes the genera *Galium* and *Asperula*. *R. tinctorum* or dyer's madder is by far the most important of the genus, on account of the fine scarlet colour afforded by the roots, and so extensively used by dyers and calico-printers. It is largely imported from Holland and the Levant. The plant grows wild in many parts of the south of Europe. The root is perennial, long, creeping, about as large as a quill, and red both without and within; from it arise several trailing, quadrangular stems, rough, branching, and 2 or 3 feet in length; the leaves are oblong-oval, and prickly on the margin and mid-rib; the flowers are yellow and small, and are disposed in a panicle at the extremity of the branches, and in the axils of the superior leaves; they appear in June and July, and are succeeded by blackish berries. The most approved method of culture is from seed, and where this practice is pursued certain precautions are requisite. As the madder of hot climates affords more colouring matter, as well as a deeper tint, it is best for those who live in a northern region to import the seed from the south. Again, when the seed is too much dried, it may remain in the ground two or three years before it will germinate. On this account it should be kept in a bed of moistened earth or sand, whenever there is any delay in sowing it. A light, rich, and deep soil is the most suitable, and it should be ploughed to the depth of 2 feet. The time of sowing is in February or the beginning of March for the more northern, and September or October for the more southern regions. This kind of crop requires but little care and attention: for the first year it is necessary only to keep it free from weeds, and to hoe it slightly once during the summer; for the second it requires hoeing in the spring, in the summer, and again, a little more deeply, in the latter part of the season; the same is requisite for the third year, except that the earth is heaped up about the base of the stems, in order to make it shoot with more vigour, and enlarge the roots. It is usual, before the second time of hoeing, to cut the stems for cattle, who are very fond of it; but this practice should not be repeated during the season, as recommended by some writers, or the roots will suffer. It is only at the end of the third year that the crop is ready for harvesting; and if it is suffered to remain in the ground beyond this period more is lost than gained. The roots at this time contain the greatest quantity of colouring matter, and have attained their full size. The best method of obtaining the roots is the following: A trench is dug along the rows to the depth of 2 feet, when, by loosening the earth about the roots, they may be taken up entire. In a good soil a single plant may yield 40 lbs. of the fresh roots, which diminish, in drying, six-sevenths or seven-eighths of their weight. The roots should be immediately washed, freed from all decayed parts, and dried as quick as possible, either by the sun or in a kiln. It is well observed that madder is a hazardous crop, as, from its yielding a return only after a lapse of three years, it is often impossible to foresee what will be the state of the market at that time. Another mode of cultivation is from the roots, which are divided and set out. Twenty thousand plants may be allotted to an acre. The madder from Holland is most esteemed, and it is cultivated in that country to a very great extent. The process of pulverizing the roots, which is done by pounding or grinding, was for a long time kept a secret by the Dutch. In the state of powder it is of an orange-brown colour, and is liable to become damp, and to be spoiled, if kept in a moist place. Madder, as it thus comes into the market, consists of a mixture of colouring substances, tarry matter, and mineral constituents. Various methods are adopted for purifying the madder; one of the most usual is by acting on the ground roots with sulphuric acid, whereby more or less of the obnoxious part is rendered soluble, and is subsequently removed by washing. The residue is now dried, finely powdered, and sold under the name of *garancine* (which see).

The colouring matters of madder readily combine with mordants to form insoluble, very stable compounds; at the same time these colouring matters show no great affinity for cotton fibres, so that a good white is easily secured on the unmordanted part of the cloth. Another advantage to be gained by the use of madder is that the dyer is not confined to one shade of colour, as by varying the mordant he is able to produce reds, browns, pinks, and blacks. The various stages in the process of madder-dyeing are as follows: —

(1.) The calico is singed and bleached.

(2.) The mordant is printed on. For reds and pinks *red liquor*, which is essentially aluminium acetate mixed with a little sulphate, is used. For violets, purples, and blacks *iron liquor*, which is essentially ferrous acetate, is employed.

(3.) The cloth is now hung up in the air or *aged*. The mordant is hereby fixed in the pores of the cloth.

(4.) The prepared cloth is *dunged*, that is, it is passed through a hot mixture of cow-dung and water. In this process the excess of the mordant, which might interfere with the subsequent processes, is removed, while the greater part of the remainder is converted into phosphate.

(5.) The cloth is steeped in the madder-bath, which is gradually raised to a boiling heat.

(6.) The dyed cloth is *cleared* by being passed through a boiling mixture, generally of soap and water.

It would appear that the madder-roots, when freshly cut, contain little or no colouring matter, but that after some time they become capable of being used for dyeing. But it has been shown that the fresh roots contain at least two peculiar substances, one a compound of carbon, hydrogen, and oxygen, the other a nitrogenized body; it has also been proved that the latter substance acts as a ferment upon the former, and that the products of this action are sugar and a new body possessed of very high tinctorial powers, to which is given the name of *alizarine*.

Not only is there alizarine existing in the madder-

root after it has been for some time cut, but in all probability there is produced in the madder-bath a fresh quantity of this colouring matter; because when the constituents of the madder-root are brought into solution they are allowed a greater freedom of action upon one another, hence the chemical changes which ensue will be more rapid.

The researches of Graebe and Liebermann have proved the formula of alizarine to be $C_{14}H_8O_4$; its formation from the pre-existing substance (xanthin or ruberythrinic acid) in the madder-root may be thus shown, $C_{26}H_{28}O_{14} = C_{14}H_8O_4 + \underbrace{C_6H_{12}O_6}_{\text{Sugar.}} + H_2O$.

This colouring matter, alizarine, can be now prepared from sources totally distinct from that of the madder plants. Certain portions of coal-tar yield a hydrocarbon called anthracene, $C_{14}H_{10}$, from which by proper treatment is prepared alizarine, $C_{14}H_8O_4$. This artificial alizarine is rapidly taking the place of that prepared from vegetable sources; the history of its discovery, and the steps by which the manufacture has been gradually worked out, furnish a brilliant example of the benefits which are certain to accrue to the arts and manufactures from the study and elucidation of purely scientific problems.

MADEIRA, an island off the western coast of Africa, belonging to Portugal, from which it is about 440 miles distant, with an area of about 313 square miles. The island consists of a collection of mountains of volcanic origin, the most elevated of which is upwards of 6000 feet high. Through the west half of the island runs a central ridge about 5000 feet high, on which is an extensive plain called Paul de Serra. The east portion of the island, though elevated, is less so than the west. From the central mass steep ridges extend to the coast, where they form perpendicular precipices of from 1000 to 2000 feet high. These cliffs are interrupted by a few small bays, where a richly-cultivated valley approaches the water between abrupt precipices, or surrounded by an amphitheatre of rugged hills. These narrow bays are the sites of the villages of Madeira. The most striking peculiarity in the mountain scenery of the island is the jagged outline of the ridges, the rudely-shaped towers and sharp pyramids of rock which appear elevated on the tops and sides of the highest peaks, as well as on the lower elevations, and the deep precipitous gorges which cut through the highest mountains almost to their very base. The road round the island is in many places exceedingly picturesque, being led often between lofty cliffs, or along the front of precipices overhanging the sea. Adjacent to Madeira is Porto Santo, a small island, and the Desertas, which, with Madeira itself, compose the group of the Madeiras. The principal production of Madeira is wine, the quantity of which in good years used to amount to 2,750,000 gallons. In 1852, however, the vine disease made its appearance, and so extended its ravages that the cultivation of the grape almost ceased, the quantity of wine exported in 1861 being only 40,000 gallons. Since then, however, the vines having been renewed, there has been a pretty steady increase, and wine again holds the principal place among the exports. The failure of the vines caused the culture of the cactus plant, for the rearing of the cochineal insect, to be introduced in many places, and with considerable success. Sugar-canes have likewise been largely planted, and a greater tract of ground devoted to the cultivation of grain, the amount formerly raised having scarcely equalled one-fifth of the consumption. Besides wine the exports are sugar, rum, &c., and fresh provisions and cattle are supplied to vessels; imports in 1882, £266,122; exports, £245,394. Three-fifths of the trade is in British ships. The mean annual temperature of Madeira is 65°, and the climate, from its constant and temperate warmth, is well known for its favourable effects on those suffering from pulmonary complaints, which renders the island a favourite resort of invalids from Britain and elsewhere. The Madeiras were known to the Romans under the name of *Purpurariæ Insulæ*. They were rediscovered by Don João Gonzales Zarco and Tristão Vaz in 1420, and the name Madeira was given to the principal island from the magnificent forests of building timber (in Portuguese *madeira*) which then covered it. It was settled by the Portuguese in 1431. Funchal is the capital. The population, which consists mainly of the descendants of Portuguese, and is considered too dense for the island, amounted in 1882 to about 134,000.

MADEIRA, or CAYARI, a large navigable river of Brazil, rising in the mountains of Chuquisaca, in the Republic of Peru. It runs an easterly course to Santa Cruz de la Sierra, with the names of La Plata, Chuquisaca, Cachimayo, and Guapay; and turning to the north enters the Amazon River in lat. 3° 25′ S.; lon. 59° 45′ W., with the name of *La Madeira*. Its entire length, from the source of the Mamore, is estimated at 1500 miles. It abounds in excellent fish.

MADISON, a city of the United States, Indiana, on the right bank of the Ohio, founded in 1808, 80 miles S.S.E. Indianapolis. It has elegant, regular, and spacious streets; a court-house, jail, market-house, and six churches; two foundries, a factory for steam-engines, a cotton factory, and several mills. Thousands of hogs are annually slaughtered here. Pop. in 1880, 8945.

MADISON, a city of the United States, capital of Wisconsin, 70 miles west of Milwaukee, was founded in 1836. It is finely situated on an isthmus between two small lakes. It contains the state-house, a university dating from 1851, a historical society, a lunatic asylum, several banks, and several daily and weekly papers, two of the latter being published in the Norwegian language. It has a large trade, and had in 1880 a population of 10,324.

MADISON, JAMES, president of the United States, 1809–17, was born in Virginia, 15th March, 1751, and studied for the bar. When scarcely twenty-two years of age he obtained a public appointment, and rose so rapidly in favour with his fellow-citizens that they sent him to Congress, where he distinguished himself by his eloquence. He had an active share in drawing up the new constitution, and contributed much to the favourable reception it met with from the people, by a series of pamphlets published in conjunction with Jay and Hamilton, under the name of the Federalist. Under the administration of Jefferson he became secretary of state. Having been afterwards chosen president, he declared his determination firmly to maintain the independence of his country, and to combat with all his might against the party of the Federalists, who were charged with an undue leaning to Great Britain. In the spirit of this resolution he interdicted all intercourse both with Great Britain and France, so long as those states should persist in maintaining the grounds which they had taken up in 1807, and by which the rights of neutrals were injuriously affected. When France withdrew her restrictions he immediately opened communications with her, while the determination of Great Britain to maintain her possessions led in 1812 to open war. This war was most disastrous to the American commerce, and Madison's popularity was greatly on the wane, when some successes in Canada, and still more the burning of Washington by the British, again restored him to general favour, and determined him to carry on the war more vigorously than ever. When peace was concluded in 1814 Madison exerted himself with great

success in promoting the general prosperity of the American union, and was anxious for some compromise between the North and South on the subject of slavery. He was succeeded in the presidency by James Monroe. His latter years were spent in retirement in Virginia, where he died 28th June, 1836.

MADNESS. See INSANITY.

MADOC, according to a Welsh tradition, son of Owen Gwynned, a Welsh prince, who, in consequence of some domestic dissensions, went to sea with ten ships and 300 men, in 1170, and discovered land in the ocean far to the west, supposed to be America. He made a second voyage to and from this unknown land, but finally was lost to the knowledge of his countrymen. The story is to be found in the Welsh Triads, and Hakluyt gives an account of the voyages in his collection. In Owen's British Remains the legend, if it is anything more, is referred to. Later travellers have imagined that they had discovered traces of these early emigrants in different parts of the country, and we have had stories of white Indians and Welsh Indians, &c. See Humboldt's Personal Narrative, book ix., note A.* Southey has made Madoc the subject of an epic poem, now little if at all read.

MADONNA (Italian), properly *my lady:* thus Petrarch often calls Laura *madonna;* but now it is more particularly applied to the Virgin Mary, as she is called in other languages *our lady.* Many celebrated pictures are known under the name of Madonna, as the famous Madonna di Sisto of Raphael in the gallery of Dresden. Till recent times the Virgin, who had come to be called the mother of God, was always represented with the Child. See Mrs. Jamieson's Legends of the Madonna (London, 1852).

MADRAS, a maritime city of British India, capital of the presidency of the same name, on the Coromandel coast. It is not well situated for commercial purposes, as it lies on an open, sterile, and sandy shore, exposed to the swell of the Bay of Bengal, which breaks upon the beach with great violence. There is a pier 1000 feet long on screw piles, and an inclosed harbour having an area of 200 acres. Madras is connected by railway with Bombay, and with Tuticorin in the extreme south. The appearance of the town when seen from a distance is disappointing, a row of mercantile offices, a few spires, and public buildings, being the chief visible objects, the low site of the city preventing a view beyond the first line of buildings. A great part of Madras consists of what is called the Black Town, containing the native and East Indian (or mixed) population, with a few European families. It is about a mile square, is very closely and irregularly built, and consists of brick houses and bamboo huts; but the garden-houses in the vicinity, in which the Europeans chiefly reside, are very neat, generally only one story high, smoothed over with fine white lime, and embowered among trees and bushes. Very few Europeans reside in the Black Town, it being hot, unhealthy, and ill-drained. The city is built on a dead level, and with the suburbs occupies an area of 27 square miles; but a considerable part of this (the municipal area) consists of a poor rural district more or less cultivated which surrounds the fort, the native town, and suburban villages. The suburbs are chiefly inhabited by Hindus and Mohammedans. Most of the Europeans and some of the East Indians live in detached houses in the environs. The public park, containing a small zoological collection, is the chief recreation ground of the city. One of the chief objects of interest in Madras is its citadel, Fort St. George, which commands the Black Town and the roads, and may be considered the nucleus of the city. It was built in 1639, and is admirably situated for the defence of the town and shipping. It contains a church, the barracks, and an arsenal; a marble statue of Lord Cornwallis is erected in the great square. The government-house, the Cathedral of St. George, and some of the other public buildings, are handsome structures. The other principal buildings are several Episcopal, Presbyterian, Independent, and Wesleyan churches, and a Roman Catholic cathedral and chapels; besides the University, the Presidential College, and a medical college, supported by government, there are large missionary institutions. From the meridian of the observatory connected with the university all India takes its time. Madras is the chief seat of all the government offices for its presidency, of the supreme court, a board of revenue, marine board, &c. Notwithstanding the disadvantages of its position it is a place of great trade. At present the landing and shipping of goods is effected partly by lighters to the pier-head, and partly by the old massula or surf-boats which land their cargoes on the beach. The imports consist chiefly of cotton goods from the United Kingdom, grain from America, wines, spirits, metals, sugar, stationery, betel-nuts, piece-goods, silk, horses, jewelry, &c. Exports—cotton, grain, indigo, cotton piece-goods, saltpetre, pepper, &c. The chief industries are connected with the preparation of goods for export, such as coffee pressing and cotton cleaning. Spinning factories have recently been established, but with what success remains yet to be seen. The country in the vicinity of Madras, at a short distance all round the city, presents a remarkable contrast to its barren sandy shore, having the appearance of a fine park. The city is the centre of an extensive system of railways which brings it into communication with all the principal places of India.

Madras was founded in 1639 by the English, who obtained the grant of a piece of ground for the erection of a town and fort from the Rajah of Chandgherry. Their first settlement on the coast was 60 miles north of Madras. Madras was the name of the native village which existed before the present town was founded. It soon became a flourishing city and the chief station of the English on the Coromandel coast. In 1702 it was besieged by Daood Khan, the general of Aurangzeb, but was bravely and successfully defended against him. In 1746 it was taken by the French, who kept it until 1749, when peace was made and the place was restored to the English. In 1758 it was again besieged by the French under the celebrated Lally, who was obliged to retreat after a siege of two months. Since that time Madras has never been assailed by an enemy, though in 1769 it was threatened by Hyder Ali, who encamped his army within a few miles of the fort, and compelled the English to enter into a treaty with him. Pop. in 1871, 395,440; in 1881, 405,848.

MADRAS, PRESIDENCY OF, one of the great territorial divisions of British India. It occupies the most southerly portion of Hindustan, stretching from the Bay of Bengal to the Arabian Sea, and almost inclosing Travancor and Mysor, while a long, narrow portion of it runs up the west side of the Bay of Bengal till it meets the Bengal Presidency about 70 miles from the mouth of the Mahánadi. It has Jaipur and Haidarabad on its north-west, and on the west borders for a short distance with Bombay. The chief mountain ranges are the Western Ghâts, the Eastern Ghâts, and the Nilgiri or Neilgherry Mountains. The principal rivers are the Godávri, and Kistna or Krishna, with their tributaries; and the North Ponnar, South Ponnar, Palar, Kaveri, Kalerun, and Vaiga. There are no lakes of any importance, but many salt lagoons or inlets of the sea. The climate generally is reckoned the hottest in India, but differs

widely in different localities according to elevation. Even in the hottest places the air is cooled and the ground refreshed in August, September, and October by frequent showers or by torrents of rain. The soil along the coasts, particularly those of the Carnatic, is for the most part light and sandy; inland it consists of a decomposed syenite, impregnated with salt, which in dry weather covers the ground with a saline efflorescence; still the district of Tanjor, on the banks of the Kalerun, is esteemed the granary of Southern India. There are some extensive forests in the presidency, yielding teak, ebony, and other valuable timber trees. The other principal vegetable productions are rice, wheat, barley, maize, and all the other grains common in India; sugar-cane, areca, yam, plantain, tamarind, jack-fruit, mango, melons, cocoa-nuts, and a variety of other fruits; ginger, turmeric, pepper, tobacco, hemp, and cotton, for the growth of which it seems to be particularly well adapted. There has been a large increase of late years in the cultivation of sugar in Madras. The wild animals met with are those common to other parts of India, namely, the elephant, tiger, chetah, bear, bison, elk, spotted deer, antelope, jackal, wild hog, jungle sheep, &c. Red cloth, muslins, carpets, and silks continue to be manufactured to a limited extent. The government of the presidency is vested in a governor subordinate to the Governor-general of India. In each of the twenty-one districts into which the presidency is divided there is a European collector, who exerts also the chief magisterial power. The educational institutions are the Madras University, granting degrees in arts, law, medicine, and engineering. Among the schools and colleges affiliated to the university is the central institution of the Free Church of Scotland. In 1881–82 the total number of educational institutions in the presidency of Madras was 15,403 (equal to about 1 for every 9 square miles of surface), attended by 393,683 scholars, or about 11 scholars for every 1000 of the population. The imports of merchandise in 1881–82 amounted to £3,886,149; the exports to £7,587,754; imports of treasure to £328,696; exports of treasure to £254,791. The revenue amounted in 1881–82 to £9,351,164; the expenditure to £7,750,174. The area is 140,430 square miles; the population in 1881, 30,868,504, a decrease of 2 per cent compared with 1871, due to the famine of 1877–78. The native protected states have in addition an area of 9192 square miles, and had (in 1881) a population of 3,303,563. The languages are Tamil, Telugu (which are spoken by the great majority of the inhabitants), Canarese, and Malayalam, with some lesser dialects spoken by the more barbaric tribes on the mountains; Mahrathi and Gujerathi prevail in the northern and north-western parts of the presidency; Uriya in the north-east; and Hindustani is the language spoken everywhere by the Mohammedans.

MADREPORES. The madrepores (*Madreporidæ*) form a family of Sclerodermic corals (which see) included in the class Actinozoa, and in the suborder *Zoantharia Sclerodermata* of that class. These corals, numbering many different species and varieties, are *perforate* in structure, that is, the coral structure of which they are composed is porous in its nature. The septa, or internal partitions of the separate coral-polypes, are present in multiples of five or six, and are well developed. The madrepores form large compound masses, which are concerned in the active growth of existing coral-reefs, and which are frequently employed in the construction of grottoes and ferneries in this country. Popularly, many corals are known as madrepores, which, however, ought not to be included under that designation.

MADRID, the capital city of Spain, New Castile, in the province of Madrid, on the Manzanares, in the centre of the Iberian Peninsula, 2450 feet above sea-level. It is built on several low and irregular sand-hills, and is surrounded by a barren and extensive plain. In winter the climate is exceedingly severe; and even in summer, when the heat also is excessive, cold, killing blasts descend from the Mountains of Guadarrama. Madrid was until recently surrounded by a wall about 20 feet high and pierced by five large and eleven small gates; of these gates only three remain: the Puerta de Alcala on the east, the Puerta de Toledo on the south, and the Portillo de San Vicente on the west. The streets are distributed somewhat irregularly around the Puerta del Sol, which is in the centre of the capital. The principal streets are broad, long, and airy; and the houses are in general well constructed, substantial, and of good appearance. The squares are generally irregular both as regards their form and their edifices, as well as deficient in decorative monuments. Of these the Plaza Mayor is one of the largest and most regular. The Plaza de Oriente is adorned with forty statues of Gothic kings, as well as of those of the Asturias, Leon, Castile, and Arragon. In the centre is a fine equestrian statue of Philip IV. Madrid having only become the Spanish capital in the time of Philip II. cannot boast of many edifices of great antiquity. The royal palace, situated at the western extremity of Madrid, is one of the most magnificent in the world. It occupies the site of the original Alcazar (castle) of the Moors, and is of enormous extent, being 470 feet each way, and 100 feet high. The architecture is a combination of Ionic and Doric. It contains a small but splendid Corinthian chapel, and a library of nearly 100,000 volumes, and the armoury is one of the finest in the world. The chamber of deputies, which occupies an area of 42,700 square feet, has a hexastile Corinthian portico on the grand façade, destined for the entrance of royalty on state occasions. On the two lateral façades are the entrances for the members. Madrid stands far behind many provincial towns as regards its churches, which are, with exception of a few attached to conventual establishments, poor, and of indifferent artistic merit. Some of the convents have been appropriated to public secular uses, some have been sold to private individuals, and others demolished, but the churches of a few have been preserved. The most important of the charitable institutions are the military hospital, an extensive building in the north-western corner of the city; and the Hospicio of San Fernando, with schools for both sexes, the pupils being taught various handicrafts. At the south-eastern corner of the city stands the general hospital, containing 1200 beds. There are three foundling hospitals and six for orphans. Among places of amusement we must mention the Plaza de Toros (bull-ring), a building which is about 1100 feet in circumference, and capable of containing 12,000 spectators. The Prado (meadow), nearly 2 miles long, is the Hyde Park of Madrid, but notwithstanding its name it has no grass. The Royal Museum of Painting and Sculpture, which stands in the Prado, contains more than 2000 pictures, including a great many by all the best masters. A new museum, containing some 1500 pictures of very varying merit, was opened to the public by Espartero in 1842. Besides these there are several good private galleries. The National Library, founded by Philip V., contains 130,000 volumes, is well managed, and is open to the public daily from ten to three. The library of San Isidoro consists of 66,000 volumes. The University of Madrid, which arose out of that of Alcalà de Henares, founded in the fifteenth century, has an average attendance of 7000 students. There are besides numerous other schools, academies, and colleges, public and

private, including a normal school, a deaf and dumb institution, a normal school for the blind, a commercial school, schools for engineers, a Conservatorio de Musica, an academy for the fine arts with a gallery of 300 pictures, a veterinary college, an academy of medicine and surgery, &c. The manufactures, among others, consist of tapestry, carpets, fine delft and porcelain, silverwork, buttons, iron-castings and machinery, coaches, beer, paper, &c. Madrid has now railway communication with Paris and Lisbon, and a line through the Sierra Morena to Cordova and Cadiz was opened in 1866.

Madrid in the Roman period probably was the insignificant hamlet Majoritum; at all events Majorit was only a Moorish outpost of Toledo when captured in 1083 by Alonzo VI. Henry IV. about 1461 made some additions to the older town, which was placed on the western eminence over the river. Madrid only began to be a place of importance under Charles V. Declared the seat of the court by Philip II. in 1560 the city rapidly grew up at the expense of the older and better situated capitals. It is the creation of a century, for it has not increased much since the age of Philip IV. The gross mistake of a position which has no single advantage except the fancied geographical merit of being in the centre of Spain was soon felt, and on Philip II.'s death his son, in 1601, endeavoured to remove the court again to Valladolid, which, however, was found to be impracticable, such had been the creation of new interests during the outlay in the preceding reign. Madrid was entered by the French under Murat, 23d March, 1808, but they were soon obliged to evacuate it. It was again held by the French from 1809 to 1812, when the Duke of Wellington entered it, and restored it to the Spaniards. After the deposition of the crown by King Amadeus in 1873, Madrid, along with the rest of Spain, suffered greatly from the anarchy caused by the struggles between the Republicans, Carlists, and Socialists; and it will be long ere even the establishment of the present settled monarchical government can efface the traces of the disasters suffered in this internecine strife. Pop. according to the census of 1877, 397,690.

MADRIGAL, a word of uncertain etymology, is applied to a short lyric poem adapted to express ingenious and pleasing thoughts, commonly on amatory subjects. It contains not less than four and generally not more than sixteen verses; and consists, commonly, of hendecasyllables, with shorter verses interspersed, or of verses of eight syllables irregularly rhymed. The earliest madrigals were those of Lemmo of Pistoia, set to music by Casella, who is mentioned by Dante. They were afterwards subjected to stricter rules in regard to the number of verses and the rhyme. In the sixteenth and seventeenth centuries we find madrigals for the organ and other instruments. The madrigals of Tasso are among the finest specimens of Italian poetry. This form has been successfully cultivated by the Germans; but the grace and elegance of the English writers of madrigals of the Elizabethan and Caroline ages have never been surpassed—viz. of Lodge, Withers, Carew, and Suckling. The English composers of musical madrigals are also especially famous, as Morley, Wilbye, Bennett, Ward, Orlando Gibbons, Dowland, and Ford. The English glee is probably a graft of the madrigal.

MADURA, a territory celebrated in the Hindu mythology, and now forming a part of the Madras Presidency, has an area of about 8400 square miles, and a population of 2,168,680. The capital of the same name contains the vast palace of the ancient rajahs, now going to decay, with its lofty dome, 90 feet in diameter, and the Great Temple, one of the most remarkable monuments of Hindu architecture, with its four gigantic porticoes, each surmounted with a pyramid of ten stories. Near the town is a remarkable eminence, called, from its shape, the Elephant Rock. Among other remarkable places in this territory is the island of Rameswaram (the Lord Rama), separated from the mainland by a narrow strait, across which stretches a line of rocks called Adam's Bridge. Chief productions, cotton, rice, sugar-cane, betel, and tobacco.

MADURA, an island of the Indian Archipelago, off the east end of Java, from which it is separated by the Strait of Madura. The island is about 105 miles long east to west, and 30 miles broad. It is divided into three portions, of which Bangkalang and Sumanap occupy, respectively, the west and east ends, and are reigned over by their own sultans, who, however, are tributary to the Dutch, to whom also the central portion, Pamakassan, exclusively belongs, forming a dependency of the province of Soerabaya. It is undulating, but not mountainous, and though in general well watered, yet in some places, especially on the coast, there is a want of water, and the soil is consequently unfertile. The interior, however, is fertile, though not so productive as Java. Maize, cocoa-nuts, tobacco, Jamaica pepper, and tamarinds are the chief products, and the exports include also birds'-nests, country cloths, white and striped, poppy-oil, rattan-mats, and baskets, &c. The chief towns are Bangkalang, Pamakassan, and Sumanap or Samanap. Pop. (1879), 768,992.

MEANDER, now MENDER, a river of Asia Minor, which takes its rise in Phrygia, not far from Celænæ. It forms the boundary between Caria and Lydia, and flows into the Icarian Sea between Priene and Myus, opposite to Miletus. It was celebrated among the ancients for its winding course. The name was thence transferred to the intertwined purple borders on mantles and other dresses, as well as upon urns and vases; hence, figuratively, meandering paths, meandering phrases; that is, artificial turns and circumlocutions, &c.

MÆCENAS, C. CILNIUS, the favourite of Augustus, and patron of Virgil and Horace, though only of equestrian rank, traced his genealogy from the ancient Etrurian kings, and numbered Porsena among his progenitors. He was probably born sometime between 73 and 63 B.C. Though it is unknown where he received his education, it must have been a good one, for he was intimate with the literatures both of Greece and Rome, and was himself an occasional writer in prose and verse. Shortly after Octavianus appeared prominently on the public stage Mæcenas seems to have been much with him, and it is known that he assisted him in the establishment and consolidation of the empire. We first hear of him authentically (B.C. 40) as negotiating a marriage between Octavianus and Scribonia; and in the same year he contributed materially to bring about the Peace of Brundisium, by which Cæsar and Antony were reconciled. Two years later he was again employed in reconciling these self-willed potentates; and B.C. 36 he was twice despatched by Octavianus from Sicily to Rome to quell disturbances which had broken out there. He was for these services intrusted with the administration not only of Rome, but of all Italy. He now disappears from history till B.C. 31, the period of the battle of Actium, when he is again found administering the civil affairs of Italy, and he succeeded in suppressing the conspiracy of the younger Lepidus, thus preventing another civil war. After the battle of Actium, when the whole power of the triumvirate centered in Cæsar, Mæcenas advised him not to restore the republic, but to establish the empire. That Mæcenas henceforth,

for a considerable time, exercised great political power, is indisputable, but we know that B.C. 16 he had ceased to enjoy it. That a coolness had arisen between Augustus and Mæcenas at some period between 21 and 16 B.C. is not to be doubted, and we have the negative proof that from this latter date there is little mention in history of the once trusted and powerful minister. His release from public cares would be far from displeasing to the wealthy votary of ease and pleasure, and his palatial residence and gardens on the Esquiline became the rendezvous of all the *literati* of Rome, and of that numerous and by no means dignified class, better known as parasites, who can contribute to the amusement of a wealthy and accomplished host. But those admitted to his intimacy were the greatest geniuses and scholars of Rome, among them being Virgil and Horace. To the intercession of Mæcenas Virgil was indebted for the recovery of his farm, and Horace owed to him still greater favours. Mæcenas was a constant valetudinarian, as might have been expected of a man of his voluptuous habits. He died B.C. 8, and having no children, he was found to have bequeathed his property to Augustus.

MAELAR, a large and beautiful lake of Sweden, intersected by lat. 59° 30′ N., and lon. 17° E. It is very irregular in shape, and throws out arms which penetrate into the land in all directions, and give its contour a very ragged appearance. Another remarkable feature is the vast number of islands which it contains. About 1260 have been counted. Its greatest length, east to west, is 75 miles, and its breadth, which varies exceedingly, may average about 12 miles. Steamers regularly ply upon it, and it is of great commercial importance, giving to the populous towns which line its banks not only a free communication with the capital and each other, but also with the Baltic, more especially by the canal which has its mouth in the Bay of Södertelje.

MAELSTRÖM, or MOSKOE-STROM (Danish, *Malström*), a whirlpool in the Arctic Ocean, off the north-west coast of Norway, immediately south-west of Moskenesoe, the most southern of the Lofodden Isles. It presents the appearance of a rapid current, which runs alternately six hours from north to south, and six hours from south to north, producing immense whirls. The depth of the water around, supposed at one time to be too great to admit of soundings, has been ascertained not to exceed 20 fathoms, with a bottom of rocks and white sand. Immediately to the west the soundings are from 100 to 200 fathoms. The whirlpool is greatest at high or low water, and when the wind is north-west, and opposed to the reflux of the waves, it attains its greatest fury, and becomes extremely dangerous, but in ordinary circumstances it may be traversed without apprehension.

MÆOTIS. *Palus Mæotis* was the name given by the ancients to what is now called the Sea of Azoph. See AZOPH.

MAESHOWE, an artificial mound on the Orcadian mainland, 9 miles west of Kirkwall, of indefinite antiquity, and the origin or use of which can only be conjectured. There is an interior chamber, 15 feet square, buttressed at the corners, and having a height of 13 feet. Leading to this is a long, low passage, 2 feet 4 inches wide at the entrance, and widening a foot before the vaulted chamber is reached. The height of the passage in no part exceeds 4 feet 8 inches. Three cells lead off from as many sides of the chamber, the largest of them being 7 feet long by 4 feet 6 inches broad. The passage is formed of slabs of stones, and the walls of the chamber of slabs piled one above another, without mortar. The vaulted roof is obtained by the successive layers gradually projecting on each side till they meet in the centre. The superincumbent mound was evidently placed over the building after it had been completed. It is a circular grassy tumulus 36 feet high, and about 400 feet in circumference. Certain Runic inscriptions and emblematic carvings have been discovered on some of the stones. These are believed to be considerably posterior in date to the construction of the building, and are probably the work of Scandinavian rovers, who had opened the barrow in the expectation of finding treasure. Antiquarians have disputed over their interpretation, and they are being gradually effaced by damp. The most probable explanation of the intention of the structure is, that it was sepulchral. There was originally an environing ditch, which is still nearly entire.

MAESTRICHT (Dutch, *Maastricht;* Latin, *Trajectus ad Mosam*), a town of Holland, capital of the province of Limburg, on the left bank of the Maas, here crossed by a stone bridge of eight arches (dating from 1280) communicating with the suburb of Wijk. It lies on the Belgian frontier, 56 miles east of Brussels, and 52 miles west by south of Cologne. Among the chief buildings are the church of St. Servais, a fine Romanesque edifice with five towers, and dating from the tenth century; and the town-hall (Stadhuis), a large, substantial, square building, with an elegant tower. Other noteworthy buildings are the courts and general prison, the commandant's house, and the arsenal. Maestricht was at one time one of the strongest fortresses in Europe, but its fortifications were dismantled between 1871 and 1878; it is, however, still a considerable garrison town. Maestricht carries on an active transit trade with Belgium, chiefly in salt, wine, and colonial produce. It has manufactures of glass and earthenware, fire-arms, shot, cloth, and paper-hangings; also iron-foundries, beet-root sugar refineries, tobacco and cigar factories, tan-pits, distilleries, and breweries, the latter producing very noted beer. About 3 miles from the town is the Pietersberg (Peter's Hill), on which stands the fort of St. Pierre, and under which are extensive subterranean quarries, supposed to have been excavated by the Romans. In these workings have been found two heads of the gigantic Mosasaurus. Maestricht was besieged and taken, and 8000 of its inhabitants were massacred, in 1579, by the Spaniards, under the Duke of Parma; in 1673 it was taken by Louis XIV., and again by the French in 1748 and 1794; William III. of England failed to take it; and in 1830 its garrison resisted successfully the attacks of insurgent Belgians. Pop. 29,595.

MAFFEI, FRANCESCO SCIPIONE, MARQUIS, born at Verona 1st June, 1675, studied in the Jesuits' College at Parma, and went to Rome in 1698, where he devoted himself to poetry. He afterwards entered the military career, served under his brother, Alessandro, in the war of the Spanish Succession, and in 1704 was present at the battle of Donauwörth as a volunteer. His literary taste soon recalled him to Italy, where he wrote his Della Scienza chiamata Cavalleresca, dedicated to Pope Clement XI., a work full of learned research into the usages of the ancients in settling private quarrels, and in which he maintains that duelling is contrary to religion, sound reason, and the welfare of society. To improve the condition of Italian literature, the decline of which he lamented, he undertook, in connection with Apostolo, Zeno, and Vallisnieri, the publication of a periodical, the object of which was to criticize native works, and make his countrymen acquainted with foreign literature. At the same time he directed his attention to the Italian drama, which he enriched by his Teatro Italiano—a collection of the best comedies and tragedies (three vols. 1723); and by his original tragedy of Merope, which met with the

most brilliant success, and went through seventy editions in the author's lifetime. His comedy La Ceremonia was also brought upon the stage with applause. To revive the study of the Greek language, which was much neglected by his countrymen, he invited skilful teachers to Verona, whom he supported at his own expense. The discovery of some important manuscripts in the cathedral of his native city gave his learned labours a new turn, one of the results of which was Verona Illustrata (1731), a work full of antiquarian and historical learning. Maffei's reputation had now extended to foreign countries, and in 1732 he set out on a visit to France, Britain, Holland, and returned by the way of Vienna, where he was received in the most flattering manner by Charles VI. He died at Verona 11th February, 1755, with the reputation of being one of the first Italian scholars of his age, and a monument is there erected to his memory. Among his numerous works the most important, besides those already mentioned, are Rime e Prose (1719); Istoria diplomatica; Museum Veronense, and other writings relative to his native city. His complete works appeared at Venice (1790, twenty-one vols. 4to).

MAFRA, a town of Portugal, in the province of Estremadura, in a bleak solitary district, 690 feet above sea-level, 17 miles north-west of Lisbon, and about 3 miles from the sea-coast. It is only deserving of notice for its vast and magnificent pile of buildings, erected by John V. in 1717, in imitation of the Escurial of Spain. It is in the form of a quadrangle, measuring east to west 760 feet, and north to south 670 feet, and includes a magnificent church adorned with numerous fine marble columns; a royal palace, a college with a library of about 50,000 vols., and a monastery with 300 cells. A small town has risen up around these buildings. Pop. (1878), 3021.

MAGADOXO, Magadosho, or Makadisho, an important town, once considered as the capital of a kingdom on the east coast of Africa; lat. 2° 2′ N.; lon. 45° 20′ E. This is the first town which occurs on the coast south from Ras Hafun in a distance of 700 miles. Magadoxo has a fine appearance from the sea: its stone houses two or three stories high, with numerous turrets or minarets rising above them, offer the outline of a well-built city; but a near approach and close inspection of its narrow streets, its dilapidated and squalid dwellings, remove this impression. The pop. is about 5000. A considerable traffic is carried on with the interior, and there is also a small export trade in dhurra, beans, pease, cattle, cotton, spices, &c. Magadoxo is subject to the Sultan of Zanzibar.

MAGALHAENS, or Magellan, Fernando de, a famous Portuguese navigator, who discovered the straits at the extremity of South America, and conducted the first expedition round the world, was born in Oporto about 1470. He served under Albuquerque in the East Indies, and distinguished himself, especially at the taking of Malacca, in 1511. Deeming his services unworthily requited by the Portuguese, he returned to Europe, and entering into the service of Spain, was intrusted by Charles V. with the command of a fleet destined to explore a passage to the Moluccas Islands by sailing westward. The voyage was commenced September 20, 1519, with five ships and 236 men. About the end of October, 1520, he entered the straits since called after his name, and on the 27th of November discovered the Pacific Ocean. Continuing his course he arrived at the Ladrone Islands, and subsequently at the Philippines, on one of which he lost his life in a skirmish with the natives in 1521. His vessels were conducted to the Moluccas and thence to Spain by Juan Sebastian del Cano, and thus (6th September, 1522) was completed the first circumnavigation of the globe.

MAGAZINES. See Periodicals.

MAGDALA, a town and fortress of Abyssinia, on the plateau of the Talanta, nearly 9000 feet above the level of the sea, and in the vicinity of the mountains of the Falla country. It stands about 120 miles south-east of Gondar, on the left bank of the Bashilo, an affluent of the Blue Nile. In itself Magdala is a place of little note, but acquired importance from its having been stormed, 12th April, 1868, by the British troops under Sir Robert Napier, afterwards Lord Napier of Magdala. (See Abyssinia.) The Abyssinians had deemed their fortress impregnable. A wall of columnar basalt, varying from 30 to 700 feet high, surrounded it on every side. It was strengthened besides by all the appliances suggested to them by their limited engineering skill, and occupied by a garrison of 1200 men.

MAGDALEN, or Mary of Magdala, so named from a city on the Lake of Galilee, by an old erroneous interpretation is confounded with the sinner mentioned in Luke vii., whose name is not given, and who, on account of her repentance and trust in Christ, was assured by him of the forgiveness of her sins. The history of her conversion from a licentious life being confounded with the story of Mary of Magdala, 'out of whom went seven devils' (Luke viii. 2) (see Mary), the ideal of St. Magdalen was formed, and has given occasion to some of the most celebrated productions of the pencil. Penitent females who had lived licentious lives early banded together, and formed a religious order under the protection of St. Magdalena, which existed in Germany before 1215; and similar institutions arose about the same time in France, Italy, and Spain. In France they termed themselves *Madelonettes*. They adopted the rules of St. Augustine, and formed various congregations, distinguished by the colour of their dress (white, gray, or black) and by the different degrees of strictness in their mode of life.

Magdalen Institutions, so called from the view of the character of Mary Magdalen already given, have also been established to afford a retreat to penitent prostitutes, and enable them to pursue the work of their own reformation. Such an institution was established in London 10th August, 1758, principally by the exertions of Dr. Dodd. These institutions are the means of restoring many thousands of repentant prostitutes to their families and society.

MAGDALENA, a large river of South America, in New Granada. It rises in the central Cordillera of the Andes, 35 miles S.S.E. of Popayan; flows generally north, and falls into the Caribbean Sea by several mouths. Its basin comprises an area of 95,670 square miles, and its whole length is 660 miles direct distance, or 970 miles including windings. Principal affluents, the Cauca and Galinazo; the former is nearly as large as the Magdalena, has its source in nearly the same latitude, and holds a parallel course till it joins it about 25 miles north-west of Mompox. The Magdalena is navigable as far as Honda, 435 miles from its embouchure. Its waters are muddy, and enter the sea with such impetus as to preserve their freshness for a considerable distance from its mouth.

MAGDALEN COLLEGE, Oxford, was founded in 1458 by William Patten, commonly called William of Waynflete, from the place of his birth, Bishop of Winchester and Lord high-chancellor of England. The foundation was for a president, forty fellows, thirty scholars called *demies*, a schoolmaster, an usher, four chaplains, a steward, an organist, eight clerks, and sixteen choristers. At different times various benefactors added exhibitions, tenable by

demies and other members of the college. In many respects Magdalen is the most noteworthy college of the university, being, according to Wood, 'the most noble and rich structure in the learned world, that is to say, that if you have regard to its endowment it it excelleth, all things considered, any society in Europe.' An ordinance framed for the college under powers granted by the act of 1854 abolished the restriction of fellowships to certain counties and dioceses, suspended ten fellowships, and added ten demyships to the statutable number. Twenty exhibitions were founded for deserving persons needing support, and four professorships, to be called Waynflete professorships, namely, of moral philosophy, chemistry, mineralogy, and physical geography, were to be maintained in lieu of the three existing lectureships of divinity, moral philosophy, and natural philosophy, founded by Waynflete. Demyships, which are of the annual value of £95, were opened without any restriction as to place of birth, residence, or education, to all candidates under twenty years of age. The college has forty-two benefices in its gift.

MAGDALENE COLLEGE, Cambridge, was founded in 1519 by Thomas, Baron Audley of Walden, the foundation estate consisting of the impropriate parsonage of St. Catherine Cree Church in London and also a considerable part of the city, anciently called Covent Garden, Christ Church. The mastership of the college is in the gift of the possessor of the estate at Audley End, Essex. There are seven open fellowships on the foundation, and twelve open scholarships varying from £60 to £20 a year each and named after their founders. There are eight exhibitions restricted to the scholars from particular schools. The annual Pepysian benefaction, value £50, is in the master's gift, and is usually bestowed by him upon poor and deserving students. The college has the patronage of six livings. The buildings consist of two courts, restored and altered in 1880, a chapel and hall dating from the 15th century, and the Pepysian Library, built in 1688.

MAGDEBURG, the capital of Prussian Saxony, on the Elbe, 76 miles W.S.W. of Berlin. It ranks as a fortress of the first class, and is regarded as one of the strongest places in Europe, its works being so extensive that military authorities consider it would require an army of 100,000 to invest them completely. The Elbe here forms several branches, and divides the town into three parts, communicating with each other by several bridges. On an island in the river is situated the citadel, also united with both banks by bridges. The houses are for the most part large and handsome, but in many places, particularly in the neighbourhood of the citadel, are very much crowded together, and a great number of the streets are narrow. The principal squares are the New Market or Domplatz, and the Old Market, which is decorated with an equestrian statue of the Emperor Otho, erected in 973, and is the site of some of the most important public edifices. The buildings most deserving of notice are the Dom or cathedral, one of the noblest Gothic structures of Northern Germany, erected in the thirteenth and fourteenth centuries, and repaired in recent times at immense expense, flanked by two towers, and remarkable within for the height of its ceiling, the beauty of its chancel and baptistery, and a number of curious monuments. St. Sebastian's church, in which is the grave of Otto Guericke, the inventor of the air-pump; the Marien or Roman Catholic church, older even than the cathedral; several other churches, town-house, and theatre. As the capital of the province Magdeburg is the seat of a number of important courts and public offices. It also possesses numerous benevolent institutions and educational establishments. The manufactures consist principally of woollen, linen, and cotton cloth, silk and cotton ribbons, leather, gloves, soap, and candles. The trade, which derives great facilities from the position of the town on the Elbe, the canal connecting this river with the Havel, and the railroads communicating with Leipzig, Halle, Berlin, and Hamburg, is of great importance. The principal articles are corn, wood, and other products of the soil; coals, wine, and colonial produce. The trade and manufactures thus carried on are not confined to the town properly so called, but several of the most important establishments have their locality in two suburbs, which are sometimes described as separate towns—Neustadt immediately to the north, and Sudenburg to the south-west. Magdeburg is a place of great antiquity, and is mentioned in records in the eighth century. It early distinguished itself in the Reformation, and long exerted a powerful influence in its favour. The hostility thus excited was the cause of its greatest disaster. In 1631, after a siege in which it valiantly defended itself, it was taken by storm and given up to indiscriminate massacre by the brutal Tilly. The most horrible atrocities were committed. A church in which hundreds of women and children had taken refuge was nailed up to prevent escape, and then burned. Above 20,000 people were murdered, and the greater part of the town was laid in ashes. Pop., including Sudenburg, at census of 1875, 87,868; at census of Dec. 1, 1880, 97,539.

MAGELLAN. See MAGALHAENS.

MAGELLAN, STRAIT OF, the channel which separates the continent of South America from Tierra-del-Fuego, and thus forms a communication between the South Atlantic and South Pacific Oceans. It is upwards of 300 miles long, and is of difficult navigation. The eastern entrance is about 15 miles wide, but shortly after expands to about 35 miles; again narrows to little more than 2 or 3 miles, and then widens to about 20 miles. From this point it presents for about 60 miles a large expanse of water, varying from 20 miles to upwards of 50 miles in width. The breadth of the remaining portion, being much obstructed by islands, cannot well be stated, sometimes not exceeding 200 fathoms, but near its western entrance it widens to about 20 and 25 miles. The tides in the strait reach an elevation of about 50 feet, the highest point they attain on the Patagonian coast. The strait was discovered in 1520 by Fernando Magalhaens.

MAGELLANIC CLOUDS, called the Nubeculæ, Major and Minor, from their cloud-like appearance, are two oval-shaped masses of light in the southern hemisphere near the pole; they are often both visible to the naked eye. Sir J. Herschel when at the Cape examined them; he describes them as consisting of swarms of stars, clusters, and nebulæ of every description. They might seem to be detached portions of the milky-way, were it not that the galaxy shows few irresolvable nebulæ. They cover spaces in the heavens of 42 and 10 square degrees respectively.

MAGENDIE, FRANÇOIS, a distinguished French physiologist and physician, was born at Bordeaux 15th October, 1783. His father was a medical practitioner at Paris, and through his introduction Magendie became the pupil of the celebrated Boyer, who made him his demonstrator of anatomy. After undergoing a suitable examination he was appointed prorector in the faculty of medicine, and shortly afterwards a demonstrator. He devoted himself especially to the study and practice of medicine, and subsequently became physician to the Hôtel-Dieu. He was elected a member of the Academy of Sciences in 1819, and in 1831 he succeeded Recamier as professor of anatomy in the College of France. Ma-

gendie was not only one of the most illustrious experimentalists and discoverers in physiology of his time, but also a laborious writer. His more important works are Formulaire pour la Préparation et Emploi de plusieurs nouveaux Médicaments (1821), treating of the operation on the animal system of such remedies as morphine, strychnine, prussic acid, and other potent active principles found in plants, as ascertained by experiments performed by himself; Précis Élémentaire de Physiologie (two vols. Paris, 1816–17), which was translated into English and German, and was long a standard manual of physiology; Leçons sur les Phénomènes Physiques de la Vie (1836–42); Leçons sur les Fonctions et les Maladies du système nerveux (two vols. 1839); Leçons sur le Sang (1839); and Récherches Philosophiques et Cliniques sur le Liquide Cephalo-rachidien ou Cerebro-spinal (1842). In addition to these he scattered many valuable papers through several periodicals, one of which, the Journal de Physiologie Experimentale, he founded and continued to edit for ten years. He contributed also to several medical dictionaries and encyclopædias. Physiology owes very much to Magendie as an experimentalist, in which capacity his industry and ingenuity were unsurpassed. His experiments on living animals became at last so numerous and matter of such notoriety that the authorities found it necessary to interfere. Among the results of his physiological inquiries may be mentioned (1) his successful demonstration that the veins are organs of absorption; (2) his demonstration of the nature and action of poisons on the human system, for example, that strychnia acts on the spinal cord, and induces asphyxia by paralyzing the nerves of respiration; (3) that the act of vomiting depends little on the action of the stomach itself; (4) his investigation of the action of prussic acid on the human system, and of its value as a remedy in certain forms of pulmonary disease; (5) his establishment of the fact that non-nitrogenous foods are innutritious; (6) his showing by experiment how easily the admission of air into the veins might occasion death in operations about the throat; and (7) he must share with Sir Charles Bell the honour of having discovered the real functions of the spinal nerves. Magendie, who had been made a commander of the Legion of Honour, died at Paris 8th October, 1855.

MAGENTA, a small town of Lombardy, 14 miles west from Milan, on the high road between Novara and Milan. It is an ancient place, and is said to have been founded in the third century by the Emperor Maximian. On 4th June, 1859, Magenta was the scene of a decisive victory won by the French and Sardinians over the Austrians. The name magenta has been applied to one of the aniline colours. (See next article.) Pop. 4931.

MAGENTA. This name is applied to a colouring substance derived from aniline; the same substance is also known under the names of *mauve*, *fuchsine*, *azaline*, *roscine*, &c. Magenta is prepared in various ways; indeed there are several varieties of this substance; all of them, however, are salts of the base rosaniline. This latter substance forms colourless crystals, containing one molecule of water of crystallization, to which the formula $C_{20}H_{19}N_3.H_2O$ is assigned. Rosaniline forms a series of magnificently-coloured salts, which are generally known under the name of magenta or fuchsine. In this country rosaniline acetate ($C_{20}H_{19}N_3.C_2H_4O_2$) is the most commonly occurring form of magenta, while on the Continent the hydrochlorate ($C_{20}H_{19}N_3.HCl$) is more generally prepared. The method at present in general use for the preparation of magenta consists in treating aniline oil with arsenic oxide, and treating the resultant dry mass with appropriate reagents in order to purify it and obtain crystals, which are again dissolved in acetic or hydrochloric acid. Owing to the very poisonous properties of the arsenic oxide, various other ways of preparing magenta have been from time to time introduced; among the substances by the action of which on aniline this substance is produced may be mentioned stannic chloride, corrosive sublimate, nitric acid, antimonic acid, &c. Pure aniline does not yield rosaniline by the treatment just described. Commercial aniline is, however, not a pure substance, but contains, besides aniline, toluidine and iso-toluidine. The action of arsenic oxide on a mixture of the two first-named substances may be represented thus: —

$$\underset{\text{Toluidine}}{\left.\begin{matrix}C_7H_7N\\ C_7H_9N\end{matrix}\right\}} + 3\,As_2O_5 = \underbrace{C_{20}H_{19}N_3}_{\text{Rosaniline}} + 3\,As_2O_3 + 3\,H_2O$$

From magenta (rosaniline hydrochlorate) a large series of other colouring matters may be obtained; thus, by treatment with aniline oil, violet colours are formed, and subsequently a blue is produced. According to Hofmann these substances are represented thus:—

Red-violet (monophenyl rosaniline)...$C_{20}H_{18}(C_6H_5)N_3$

Blue-violet (diphenyl-rosaniline).....$C_{20}H_{17}(C_6H_5)_2N_3$

Blue (triphenyl-rosaniline).....$C_{20}H_{16}(C_6H_5)_3N_3$

By treating magenta dissolved in alcohol with the iodides or bromides of the alcohol radicles a series of violet colours are formed, known as Hofmann's violets, which are rosanilines with varying amounts of ethyl or methyl substituted in the place of hydrogen.

By treating rosaniline acetate with methylic iodide and methylic alcohol under a high pressure, and subsequent purification of the product, a green pigment, having the constitution $C_{20}H_{16}N_3OI_2$, is obtained. Aniline blacks and browns are also known in commerce. The production of these colours is now carried on on a very large scale, 3,000,000 or 4,000,000 lbs. of aniline having been manufactured in the year 1871.

MAGGIORE, Lake. See Lago Maggiore.

MAGI, the hereditary priests among the Medes and Persians, somewhat resembling the Levites of Hebrew history. They were set apart to manage the sacred rites, and preserve and propagate the sacred traditions. They formed one of the six tribes into which the Medes were originally divided, and after the overthrow of the Median Empire they retained great authority and influence at the court of their conquerors. Under Cyrus the institution of the Magi rose to the highest importance, and instead of confining themselves to their traditional and historical sphere of action, they became diviners and astrologers. This connection of the Magi with astrology and enchantment in time brought it about that they acquired unbounded influence both in public and private life, were intrusted with the education of the youthful princes, and became the constant and trusted companions of the sovereign. Having entered into a plot to restore the supremacy of the Medes, they became the victims of a general massacre; still they remained the only recognized ministers of the national religion. The great reformer of the order was Zoroaster, who attempted to reinforce the ancient laws, binding them to simplicity and severity of life. The ceremonies attending initiation were awful and mysterious in the extreme. From Jer. xxxix. 3 it would appear that the Babylonian priests were also called Magi; and men celebrated for wisdom had, in course of time, this term applied to them. Gradually, however, their importance began to dwindle, and ultimately they sank into mere jugglers, fortune-tellers, and quacks, and supplied a name to the art of conjuring or juggling.

The name has had various etymologies assigned it. Gesenius has conjectured that the word may be connected with the root meaning *great;* while others derive it from *mag* or *mogh*, in the Pehlvi language signifying priest. See ZOROASTER.

MAGIC. Men, as soon as they began to observe the phenomena around them, could not help seeing the close connection which exists between man and external nature. When the sun sets he wants rest, and sleep approaches with night; atmospheric changes affect his health; certain wounds become painful with the change of weather, or at certain phases of the moon; some men are painfully affected in the presence of particular animals. (See ANTIPATHY.) Certain liquids exhilarate, others destroy life. Such and similar observations, combined with many of an erroneous and exaggerated character, springing from credulity and ignorance, soon led men to treat this mysterious connection of man and nature, and the influence of things or causes without him upon his mind and body as a peculiar science, which, when occupations were not yet divided, of course belonged to the priests, whose exclusive possession of knowledge made them the guides of men in science and the arts as well as in religion. This is considered by some the natural origin of supernatural magic; others, on the contrary, believe that there once actually existed a deeper knowledge of the powers and influences of nature, transmitted from earlier and purer ages; and others believe that men once possessed the means of producing supernatural effects with the assistance of evil spirits. Supernatural effects were at an early period naturally associated with the exercise of the healing art. In the rudest stages of society this was confined to the women, and naturally arrived at the dignity of a profession in the hands of the older, whom experience had gifted with superior skill. As their art was for the most part a mystery to themselves, they gradually came to be regarded as objects of fear as much as of hope, and magic medicines became synonymous with poison. The sorceress, poisoner, and witch were in time reckoned identical. (See WITCHCRAFT.) Media, Persia, and the neighbouring countries, famous for their knowledge of astronomy and astrology, are described as the chief seats of the ancient Magi, whose doctrine seems to be, in part, of great antiquity. This doctrine represented opposition or strife as the parent and original cause of all things. After the opposition between light and darkness, Ormuzd and Ahriman, was established, the whole series of finite beings, the whole sensual world, proceeded from this constant struggle of light and darkness, good and evil. The change of day and night, light and darkness, the whole series of ages, time itself, is only a consequence of this struggle, in which sometimes light, sometimes darkness, appears victorious, until finally light shall conquer for ever. If all finite things stand under the influence of preserving and destroying powers in nature, it is clear that he who could master these powers could dispose at his pleasure of the things subject to them; and the doctrine of the Magians was that by prayer and a true knowledge of those laws of opposition, love and hatred, light and darkness, such power could be obtained; and that thus also it was possible to pry into futurity. But it was believed that as the world became sinful the light of the ancient doctrine of the Magi was obscured, and those who bore the name became at last only evil-disposed sorcerers. One important branch of their art was now the excitement of love by potions and enchantments. Their love-potions consisted partly of ingredients which are still known to the physicians as stimulants, partly of parts of animals who had died longing for food or air, or the saliva of hungry dogs, and other still more disgusting substances. Magic at this period also occupied itself with fortune-telling, calling up the dead, bewitching by the look—a superstition which we find existing in the processes against witches in modern times, with the preparation of amulets, the inflicting of pain on a person by correspondent applications to his image in wax, &c. It can hardly be doubted that the art of the ancient magicians was founded to a considerable degree upon a knowledge of the powers of nature superior to that of the general public. At one time magic was greatly studied in Europe, and many distinguished names are found among its students and professors. The most famous of these are Albertus Magnus, Roger Bacon, Cornelius Agrippa, Michael Nostradamus, John Dee, William Lilly, &c. &c. The Dogme et Rituel de la Haute Magie (two vols. Paris, 1856) of Eliphaz Levi gives an interesting account of the discipline and ceremonies of the art. Among modern works on the subject are Sir David Brewster's Letters on Natural Magic Ennemoser's History of Magic, Davies Hutchinson's Historical Essay on Witchcraft, Sir Walter Scott's Demonology and Witchcraft, and Charles Mackay's Memoirs of Extraordinary Popular Delusions. See DIVINATION, DEMON, WITCHCRAFT.

MAGIC LANTERN, an optical instrument by means of which an enlarged representation of small figures, painted with transparent varnish on slides of glass, is obtained on a screen in a darkened room. The instrument consists of a lantern, generally of tin, and cubical in form, having in the interior a powerful Argand lamp, the pencils of light issuing from which pass through a convex lens. It is most commonly used as a toy, and amusement is derived from the grotesque character of the figures; but it is also valuable for the purposes of science in enlarging astronomical and other diagrams to illustrate lectures, so that they may be seen by an audience. The principle of its construction is very simple. A lamp is placed within the closed lantern with its burner in the focus of a concave mirror, the reflected light from which passes through a horizontal tube on a level with the flame. This tube contains two lenses, the one a hemispherical illuminating lens, of short focus, to condense a strong light on the picture, and the other a double convex lens, which receives the rays after they have passed through the picture, and throws them on the screen. The picture is inserted through a transverse slit into the tube between the lenses. That the representation may appear erect the picture must be inserted into the tube in an inverted position. The screen must not be too far removed from the lantern, otherwise the image will become indistinct and distorted. The tube is made to pull out, so that the distance of the lens from the slider being capable of being increased or diminished, an image of any moderate size, larger or smaller, may be formed, by increasing or diminishing the distance between the lantern and the screen. Athanasius Kircher is said to have invented the magic lantern in the seventeenth century. It is described by him in his Ars magna Lucis et Umbræ.

MAGIC SQUARE is a term applied to a series of numbers in arithmetical progression, arranged in the equal cells of a square, in such a manner that the vertical, horizontal, and diagonal columns shall give the same sums. The question of magic squares is in itself of no use, yet it belongs to a class of problems, the investigation of which is far from useless. The first who treated of them was Emanuel Moscopolus of Constantinople, who wrote in Greek in the middle of the fifteenth century. Others who have written on the same subject are Stifels, Leibnitz, Frenicle, Bachet, Poignard, Lahire, Saurin, Ozanam,

Franklin, &c. The history of the subject is given in Montucla, vol. i. p. 346, and in Hutton's Dictionary, and the method of constructing them may be found in Ozanam's or Hutton's Mathematical Recreations. The methods given for constructing them are divided into different rules, but no general method has yet been found that shall apply to all cases. The first sixteen numbers are arranged as a magic square in the annexed table:—

1	16	11	6
13	4	7	10
8	9	14	3
12	5	2	15

Frenicle has shown 880 methods of making these magical squares, and only those squares are included which are essentially different. Dr. Franklin invented a puzzle similar to this called the 'magic circle.'

MAGINN, WILLIAM, LL.D., a noted popular writer, was the son of a schoolmaster at Cork, and born there on 11th November, 1794. He was educated at Trinity College, Dublin, which he entered at ten years of age, and where he greatly distinguished himself. After leaving college he acted for a time as assistant to his father, and after the latter's death conducted the school himself for a number of years. In 1819 he became a contributor to Blackwood's Magazine, under the name of Morgan O'Doherty, and about 1823 established himself as a literary man in London. In 1825 he acted as Paris correspondent to a short-lived daily paper called The Representative. In 1828 he became junior editor of the Standard newspaper, with which he remained connected to the close of his life, and about the same time published his novel of Whitehall, or the Days of George IV. In 1830, in conjunction with Hugh Fraser, he projected and established Fraser's Magazine, of which, for several years, his contributions were the main excellence and stay. From the irregularity of his habits his circumstances became so embarrassed that in 1842 he was lodged as a debtor in Fleet prison, and shortly after regaining his liberty he died at Walton-on-Thames, on the 20th August of the same year. Dr. Maginn's leading characteristics are a vivid and prolific fancy, combined with an exuberant flow of rollicking Irish humour. His classical and linguistic attainments were of the highest order, while as a critic no man has displayed greater powers of sarcasm. Personally he was noted for his *bonhommie* and genial qualities, though his thoughtlessness in pecuniary matters kept him always more or less in difficulties.

MAGISTRATE, a public civil officer, invested with the executive government or some branch of it. Thus in monarchical governments a king is the highest or first magistrate. But the word is more particularly applied to subordinate officers, as governors, intendants, prefects, mayors, justices of the peace, and the like. The Latin *magistratus*, which contains the same element as *magnus* and *magister*, signifies both a person and an office. Hence the original notion of a magistrate involves election to an office, and the possession of jurisdiction. In England the term is improperly restricted to justices of the peace in the country, and to police and stipendiary magistrates in London and the larger towns.

MAGLIABECCHI, ANTONIO, a learned Italian, who was librarian to the Duke of Tuscany, celebrated alike for the variety of his knowledge and the strength of his memory. He was born at Florence in 1633, and in the early part of his life was engaged in the employment of a goldsmith, which he relinquished to devote himself to literary pursuits. He was assisted in his studies by Michael Ermini, librarian to Cardinal Leopold de' Medici and other *literati* residing at Florence. Through unremitting application he acquired a multifarious stock of erudition, which made him the wonder of his age. Duke Cosmo III. made Magliabecchi keeper of the library which he had collected, and gave him free access to the Laurentian Library and the oriental MSS., and of the latter collection he published a catalogue. His habits were very eccentric. His attention was wholly absorbed by his books; among which he took his rest and his meals, dividing his time between the ducal library and his private collection, interrupted only by the visits of persons of rank or learning, attracted towards him by the report of his extraordinary endowments. He left no literary work deserving of particular notice; but he freely afforded information to those authors who sought his assistance in their own undertakings, his prodigious memory enabling him to furnish the exact reference to any page or paragraph of the numberless volumes he had read. Notwithstanding his sedentary mode of life, and his highly irritable temper, he was eighty-one years old when he died, in July, 1714. He left his valuable private library of 30,000 volumes to his native city Florence, which is open to the public, and known by the name of Magliabecchiana. He left funds for its future care and extension.

MAGNA CHARTA LIBERTATUM, the Great Charter of Liberties, extorted from King John by the confederated barons in 1215. The barons who with their followers composed 'the Army of God and the Holy Church' were the whole nobility of England; their followers comprehended all the yeomanry and free peasantry, and the accession of the capital was a pledge of the adherence of the citizens and burgesses. John had been obliged to yield to this general union, and in June both parties encamped on the plain called Runnymede, between Windsor and Staines, on the banks of the Thames, and conferences were opened between the king and his barons. The preliminaries being agreed on, the barons presented heads of their grievances and means of redress, in the nature of the bills now offered by both houses for the royal assent. The king, according to the custom which then and long after prevailed, directed that the articles should be reduced to the form of a charter, in which state it issued as a royal grant. The charter was signed on the 15th of June. Copies were immediately sent to every county or diocese, and ordered to be read publicly twice a year. The most accurate and complete copy is that preserved in Lincoln Cathedral. The board of commissioners on the public records ordered a fac-simile of it to be engraved, and it has been frequently translated into English. To secure the execution of the charter John was compelled to surrender the city and Tower of London, to be held by the barons till August 15, or until he had completely executed the charter. A more rigorous provision for securing this object is that by which the king consented that the barons should choose twenty-five of their number to be guardians of the liberties of the kingdom, with powers in case of any breach of the charter, and the delay or denial of redress, to make war on the king, to seize his castles and lands, and to distress and annoy him in every possible way (saving only the persons of the royal family), till

justice was done. Many parts of the charter were pointed against the abuses of the power of the king as lord paramount; the tyrannical exercise of the provisions of the forest laws was checked, and many grievances incident to feudal tenures were mitigated or abolished. But beside these provisions it contains many for the benefit of the people at large, and a few maxims of just government, applicable to all places and times, of which it is hardly possible to overrate the importance of the first promulgation by the supreme authority. 'No scutage or aid shall be raised in our kingdom (except in the three cases of the king's captivity, of the knighting of his eldest son, and of the marriage of his eldest daughter) but by the general council of the kingdom.' This principle, that the consent of the community is essential to just taxation, has been the life of the British constitution. The thirty-ninth article contains the celebrated clause which forbids arbitrary imprisonment and puniahment without lawful trial: 'Let no freeman (*nullus liber homo*) be imprisoned or disseized, or outlawed, or in any manner injured or proceeded against by us, otherwise than by the legal judgment of his peers, or by the law of the land. We shall sell, delay, or deny right or justice to none.' This article contains the writ of *habeas corpus* and the trial by jury, the most effectual securities against oppression which the wisdom of man has devised, and the principle that justice is the debt of every government, which cannot be paid without rendering law cheap, prompt, and equal. The twentieth section is hardly less remarkable:—'A freeman shall be amerced in proportion to his offence, saving his contenement, a merchant saving his merchandise, and the villain saving his wagonage.' The provision which directs that the supreme civil court shall be stationary, instead of following the king's person, is an important safeguard of the regularity, accessibility, independence, and dignity of public justice. At the same time a charter was granted mitigating the oppression of the forest laws, which has been printed along with the great charter. Both charters are thus easily accessible. The Great Charter was frequently confirmed: four times by Henry III., and no fewer than thirteen times by Edward III. Blackstone has given an edition of the charter, with an introduction, in his Law Tracts.

MAGNA GRÆCIA, the name given in ancient times by the Greeks themselves to that part of southern Italy which was inhabited by Greek colonists. Though not found in any author earlier than Polybius, the name was in use in the time of Pythagoras. Strabo includes the Greek cities of Sicily under the appellation, but the name refers generally only to the Greek cities in the south of Italy, with those on the shores of the Tarentine Gulf and the Bruttian Peninsula, with Velia, Posidonia, and Laüs, on the west coast of Lucania. The name was not at first territorial, or co-extensive with any region, but applied merely to the Greek cities on the coasts. Cumæ was the most ancient of all the Greek settlements in Italy, but from its remote position it was in a great measure isolated from the later Greek settlements. The Achæans were the real colonizers of Southern Italy, their first settlement being Sybaris (720 B.C.) A few years later (708 B.C.) Spartan colonists founded Tarentum, and to counteract their encroachments the Achæans founded Metapontum, on the frontier of the territory of the Tarentines, between 700 and 680 B.C. The history of the contemporary Ionian colony of Siris is extremely obscure. The Locrians founded further south the city known as Locri Epizephyrii, nearly contemporary with Crotona (710 B.C.) The Chalcidic colony of Rhegium, on the Sicilian Straits, appears to have been more ancient even than Sybaris. The Greek cities on the shores of Bruttium and Lucania were, Velia excepted (540 B.C.), offshoots from the earlier settlements, and not founded by colonists direct from Greece. Posidonia, Laüs, and Scidrus were off-shoots from Sybaris; Terina and Caulonia from Crotona; and Hipponium and Medma from Locri. Pandosia, Petelia, Temesa, and Scylletium became gradually Hellenized without ever receiving Greek colonies. These Greek cities in Italy rose rapidly to a high state of prosperity, the result directly of the extraordinary fertility of the district in which they were planted. The arrival of Pythagoras at Crotona (530 B.C.) produced a marked change in the cities of Magna Græcia, and led to the introduction of great political changes. He and his followers were ultimately expelled from Crotona. Bitter and bloody quarrels arose between the different cities, and finally the Romans sent colonies to Calabria, and partly in that way, partly by conquest, became (272 B.C.) masters of all the Greek colonies. The Greek was no longer the sole language in Calabria; the Latin was also spoken; and an intermixture of the Grecian and Roman manners and usages took place which is yet perceptible. Magna Græcia comprised the provinces of Campania, Apulia, Iapygia, Lucania, and Bruttium.

MAGNESIA. See MANISA.

MAGNESIUM. In the beginning of the eighteenth century a new medicine was announced from Rome. This medicine consisted of a white earth, to which the name of *magnesia alba* was given. Like others of the white earths, it was for some time supposed to be the same as lime; but various chemists showed that this opinion was erroneous, and Davy eventually obtained from it the new metal *magnesium*. Magnesium occurs in nature chiefly as hydrate, borate, carbonate, phosphate, chloride, and sulphate, and in conjunction with other minerals as silicate.

1. *Magnesium hydrate*, or *Brucite*, $Mg H_2 O_2$, occurs native in Unst, one of the Shetland Islands, in the Ural Mountains, in one part of France, in New Jersey, and in New York state. This mineral crystallizes in rhombohedral forms. Hardness = 1·5; specific gravity = 2·35. In thin laminæ Brucite is flexible; it dissolves in acids, and gives off water when heated without fusing.

2. *Magnesium carbonate*, or *magnesite*, $Mg C O_3$, occurs associated with small quantities of iron, manganese, and calcium carbonates, in Moravia, Styria, Silesia, Piedmont, Spain, and the United States. This mineral, when crystallized, assumes rhombohedral forms, isomorphous with calc-spar; its hardness is 3·5 to 4·5; its specific gravity 2·8 to 3; its colour varies from white to yellow, gray, and brown; its lustre is vitreous or silky, and it exhibits all degrees of transparency, down to complete opacity.

3. *Magnesium chloride*, $Mg Cl_2$, occurs plentifully in sea-water, and in many mineral springs.

4. *Magnesium sulphate*, or *Epsom salts*, $MgSO_4 7H_2O$, is widely disseminated. At Idria it is found in the form of silky fibres or fibrous masses, in which form it likewise occurs in France, Arragona, Catalonia, in Chili, and in South Africa, where it forms a layer in a grotto 1½ inches thick. In many of the Kentucky caves *Epsomite* is found in small crystals, thickly strewed over the floor, or adhering to the roof in masses like snow-balls. This salt is a frequent constituent of mineral springs, and is also present in sea-water. The specific gravity of Epsomite is 1·75.

5. *Magnesium silicates* form a large series of minerals, among which may be mentioned *olivine*, *chrysolite*, *serpentine*, and *meerschaum*. The last-named silicate is a compact, smooth, white mineral, found in Asia Minor, in Greece, in Moravia, and in Morocco;

[illegible]

MAGNESIUM, [illegible] (MgO) [illegible] other [illegible] acid. [illegible] ignoring [illegible] if, however, [illegible] for [illegible] with water. [illegible] magnesium [illegible] in water for a length of time, is changed into a hydrate, $Mg_2H_2O_3$, [illegible] if, however, the oxide is [illegible] for [illegible] hours, it loses the property of hardening with water. An oxide may be prepared by igniting magnesium [illegible] these, when [illegible] with water, and after a time [illegible] further action as used as Portland cement.

Ordinary calcined magnesia is prepared by igniting [illegible] carbonate for a considerable time: it is a fine, very bulky, white powder, having a specific gravity of 3·2 to 3·3; it needs only at the very highest temperatures, being then converted into a crystalline, hard enamel. It is tasteless and inodorous, and has a slight action on vegetable colouring matter.

Magnesium chloride ($MgCl_2$), as we have already learned, is found in seawater: it may be formed artificially by burning the metal in chlorine gas, or by dissolving the oxide in hydrochloric acid, adding ammonium chloride, evaporating the double salt to crystals, and then driving off the ammonium salt by means of heat. As thus prepared magnesium chloride forms colourless, flexible plates, which have a pearly lustre and a bitter taste. It deliquesces in water with a considerable rise of temperature.

This chloride forms, with other chlorides, a series of double salts.

A fluoride of magnesium (MgF_2) and also an iodide (MgI_2) are known.

Magnesium also combines with phosphorus and

[illegible]

[illegible]

[illegible]

of Snorro Sturluson, Are Frode was born in the year 1068. This account was therefore probably written about the end of the eleventh century.' We have thus strong evidence that the compass became known in Northern Europe between the years 868 and 1100. From several sources there is evidence that it was pretty generally known through Europe in the thirteenth century.

Barlow (in the Encyc. Metrop.) gives the following description of the mariner's compass as employed by sailors, taken from a poem by Guy of Provence. It seems that they floated a needle on water by fastening it to a straw:—'This same star does not move, and they (the mariners) have an art which cannot deceive, by the virtue of the magnet, an ugly brownish stone to which iron adheres of its own accord. Then they look for the right point, and when they have touched a needle (on it), and fixed it on a bit of straw lengthwise in the middle, without more, and the straw keeps it above; then the point turns just against the star undoubtedly. When the night is dark and gloomy that you can see neither star nor moon, then they bring a light to the needle; can they not then assure themselves of the situation of the star towards the point? By this the mariner is enabled to keep the proper course; this is an art which cannot deceive.'

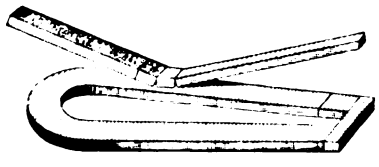
That a suspended magnetic needle does not point due north and south seems, from a letter of R. Adsing, dated 1269, and preserved at Leyden, to have been known to the writer. This discovery of the declination has been erroneously attributed to Columbus. To Norman, an Englishman who wrote in 1581, the discovery of the dip has been attributed. Dr. Gilbert, a physician to Queen Elizabeth, was the first to publish a theory of terrestrial magnetism.

When a magnet of any shape is suspended at its centre of gravity in several ways, so that it is always quite free to turn, in every case when it comes to rest there is one straight line in it which is found in the same position, this straight line is called the *axis* of the magnet. To find the axis of a magnet of irregular shape is a good exercise for students. When the magnet is a regular bar of steel the axis is usually the line joining the middle points of its two ends. The greatest attractive power for iron-filings is found at or near the ends of a magnet (this may be shown by rolling it in iron-filings), and these ends are called its *poles*. In long thin magnets it is often useful to consider the two ends as two points capable of exerting equal attracting forces on iron-filings, and to consider these points as being joined by a straight line (the axis), whose length is that of the magnet. This supposition that magnetic properties are exhibited only near the ends of a magnet is true only for small bars of excessive thinness, but it is common, and represents the facts very well. When a magnet is free to turn horizontally it comes to rest pointing nearly north and south; let the end towards the north be marked N; we shall call this the marked or positive pole, the other being unmarked or negative. By bringing a second suspended magnet near the first it is seen that they exert a mutual action, the marked poles repel each other, and the unmarked poles repel each other; but marked and unmarked poles attract each other. Thus we see that although the two poles of a magnet exert equal attracting forces for iron-filings, their actions on a pole of any magnet brought near are very different, one exerting an attracting and the other an equal repelling force. The poles of some magnets exert greater forces than the poles of others; let us suppose that the strength of a pole depends on the quantity of *magnetism* existing there; then if m is the amount of magnetism in the pole of a magnet, and if m' is the magnetism in the pole of another magnet, the attraction or repulsion between these two poles will depend on the product mm'. It has been established by the experiments of Coulomb, Gauss, Weber, and others that the attraction or repulsion between two such poles when their distance asunder is d, is inversely proportional to d^2. This law and the above supposition have enabled physicists to treat of magnetism quantitively by means of mathematics; for when the attractive or repulsive force is put equal to $\frac{mm'}{d^2}$, our knowledge of the absolute unit of force (the force which, acting for one second on a body whose mass is 1 gramme, will give it a velocity of 1 centimetre per second. See MECHANICS) enables a unit quantity of magnetism to be defined.

The space in the neighbourhood of a magnet is called the *magnetic field* (see FIELD, LINES OF FORCE); a piece of soft iron brought into this space becomes magnetic (see INDUCTION, MAGNETIC); a magnet brought into this space becomes subject to forces tending to cause motion.[1] The effects produced in soft iron or on a magnet are usually spoken of as due to the magnetic field, instead of the magnet itself, for the very same properties may be produced in a space by a combination of other magnets, or by the presence of an electric current. It is important to know the direction and amount of the force acting upon a magnetic pole when in any magnetic field; this is usually given for all parts of the field by drawing lines of force. A small magnetic needle brought into any part of a field tends to place itself along a line of force. A magnetic needle perfectly free to move will place itself under the influence of the earth's magnetism, pointing nearly north and south and downwards; in fact it places itself along one of the lines of force of the magnetic field surrounding the earth. (See MAGNETISM, TERRESTRIAL.) When the lines of force of a field are properly drawn they not only indicate at every place the direction of magnetic force (direction of magnetic induction and of the force acting on a small pole), but their proximity to one another indicates the amount of this force at any place, so that on examining them we can at once find the most intense parts of the field. In telegraphic instruments the armatures, &c., moved by the production of magnetic fields are placed in the most intense parts of the fields, and are usually as small as possible. Soft iron becomes magnetic almost instantaneously in a field, but it loses its magnetism as rapidly on removal from the field. Steel has *coercitive force*, in virtue of which it requires time for magnetization, and retains its magnetism on removal from the field. Iron and steel may become magnetic, temporarily or permanently, by the earth's induction. Iron in a state of tremor or jar is peculiarly fitted to receive and retain magnetism, but not for a very long time; it is said to acquire sub-permanent magnetism (see end of article MAGNETISM, TERRESTRIAL). Hard steel may be made magnetic by rubbing it once or twice in the same direction with a powerful magnet, or even by touching it at one end with the magnet. The magnetization is greater when the

[1] The earth is so large that its lines of force in an ordinary room are practically parallel to one another; when the lines of force in any space are parallel they are said to form a *uniform* field. If a uniform field is such that a pole containing unit quantity of magnetism is acted on by unit force, the field is called a *unit* field. In such a field if a small magnet is at right angles to the lines of force the couple (see MECHANICS), tending to bring it parallel to the lines of force is equal to the magnetism of either of its poles multiplied by the distance between them, and this product is always called the *moment of the magnet*. The moment of a magnet divided by its volume has been called the *intensity of magnetization* of the magnet.

opposite poles of two similar bar magnets are placed near each other in the middle of the steel bar, and drawn simultaneously one to each end, and the process repeated a number of times; the rubbing magnets must be kept inclined from one another. In the figure this method is employed in making a horse-



shoe magnet; a small piece of wood prevents the touching of the rubbing magnets when brought near one another. A still more complete magnetization is produced when the ends of the steel bar are supported on the opposite poles of a second pair of similar magnets. In all cases the process of rubbing is repeated on the other side of the bar in the same direction. The most powerful permanent magnets are produced by rubbing bars of steel on electro-magnets (see ELECTRO-MAGNETISM), or by moving them backwards and forwards along the axis of a coil of wire in which an electric current is passing. A bar is magnetized to saturation when its magnetism is as great as it can retain without future sensible loss. The amount of magnetism in a saturated bar depends on the quantity of carbon and impurities in the steel, as well as on its hardness and more or less uniform texture throughout. Change of temperature affects a bar's magnetism, which may be completely destroyed by raising the bar to a dull red heat. When the bar is nearly saturated any concussion will diminish its magnetization, and even without concussion it becomes weak in time unless a keeper is applied. (See KEEPER.) The best magnets are made of steel of a 'drill temper.' When harder than this they are apt to magnetize irregularly, or to have consequent points. A magnetic battery consists of a number of magnets bound together, similar poles being in the same direction. The induction exercised by each magnet on all the rest causes the battery to exert forces which are much less than the sum of the forces of all the separate magnets. It is for this reason that the possible magnetization of long thin bars is much greater in proportion to their volume (in fact, their intensity of magnetization is greater) than that of thick bars, for these may be supposed to consist of a great number of thin bars of the same length well tied together. Part of this effect is due to the fact that uniformity of hardness and texture are more easily produced in thin than in thick bars.

In a thin bar magnet the force is greater near the ends; for instance, in a bar 8 inches long the greatest forces were found by Coulomb at two points 1·6 inch from the ends; the force decreases towards the middle of the bar, where it vanishes.[1]

When a magnet is broken into a number of pieces each piece is found to be magnetic, and its N pole is found to have been directed towards the N pole of the unbroken magnet. When these pieces are put together again poles placed in contact nullify each other, and the original magnet is reproduced. The observed facts are best explained by supposing a magnetic bar to consist of a great number of very small short magnets, the N poles being all directed to the N pole of the bar. The forces of all these little magnets nullify each other at the middle of the bar, and produce the observed effects at the ends.

Theories of Magnetism.—(1.) Every particle of iron in an unmagnetized bar is supposed to contain equal quantities of two magnetic fluids, called positive and negative, which have a mutual attraction for one another; these fluids are intimately united in the particle, and neutralize one another. When the bar is brought near a magnet the marked pole N (or positive pole) attracts negative fluid, and repels positive, so that in every little particle of the bar there is a separation of the fluids; this produces the same effect on all external bodies as if the negative fluid were all attracted towards one end of the bar, and the positive repelled to the other end. The coercitive force of steel is its resistance to the motion of the fluids. (2.) Weber's theory is that the particles of iron are always magnetic; that is, the extremities of every particle are always magnetic poles, but in the ordinary state of iron these poles are turned in all directions, so that they neutralize each other's effects. Magnetization causes the positive poles to be turned generally in one direction, and the negative in the opposite, a supposition sufficient to explain observed phenomena.[2] It is evident that the greatest possible magnetization would be produced in a bar if the magnetic axes of the particles were all exactly parallel to one another; thus, the magnetization of a bar increases to a limit as the intensity of the magnetizing field becomes greater and greater. Beetz's experiments confirm this theory; he deposited iron by electrolysis in a fine straight scratch in wax, the electrolyte being under magnetic influence at the time. He found the magnetization of the deposited iron to be very great; it could not be increased by any means, the permanent magnetism being affected only by magnetization in the reverse direction. This is due to each molecule being free to take up a position when being deposited. After a certain amount of deposition there is not the same freedom to take up proper positions, and the filament of iron is found to be less strongly magnetic when thick. If the particles had not been magnetic the magnetization would have depended on the amount of magnetic influence in the solution, and experiment shows that it does not. Professor Clerk Maxwell investigates Weber's theory mathematically; he shows that:—(*a*) If iron is magnetized with a certain magnetic force of intensity χ_a, its magnetism cannot be increased by a smaller force than χ_a; a reverse force less than χ_a may diminish it: (*b*) If the iron is demagnetized by a reverse force χ_b, it is impossible to magnetize it in the reverse direction without a force greater than χ_b, but a positive force less than χ_b will remagnetize it in the positive direction. (3.) Currents flowing in wires are capable of exerting attractive and repulsive forces on other currents and on magnets; in fact they give to neighbouring space properties which cannot be distinguished from those of magnetic fields. Ampère supposed a current to circulate round every molecule of iron; magnetization causes the currents of all molecules in a bar to circulate in the same direction; the attractions and repulsions of such currents for one another would produce all observed magnetic phenomena. See ELECTRO-MAGNETISM.

[1] From some want of uniformity in texture or composition, or in the magnetizing process, a reversal of magnetization is sometimes found at some part of the bar; thus, there is a third pole between the other two, this pole is called a *consequent point*. The bar may be supposed to consist of two magnets, with their poles of the same name placed together.

[2] When magnetization and demagnetization of a soft iron bar are produced by passing and stopping an electric current (see ELECTRO-MAGNETISM) in a surrounding coil of wire, at every sudden stoppage of the current a sharp sound is heard. Wertheim showed that magnetization slightly lengthens a bar of soft iron, and demagnetization shortens it.

The connection of magnetic with other physical forces depends on the fact, that when a conducting wire and a magnet are moved relatively to one another, currents are produced in the wire, which may be changed into heat or chemical action or some other form of energy. (See INDUCED CURRENT.) Faraday in his experiments on the action of magnetism on heavy glass when transmitting polarized light (which see), found that a bar of glass supended by a thread between the poles of a powerful electro-magnet tended to take up a position at right angles to the line joining these poles (he called the line joining the poles the *axial* line, and the line at right angles to this the *equitorial* line), and also that the heavy glass was repelled by the magnetic poles. In his paper in the Phil. Trans. 1846, he gives the result of an examination of fifty-six bodies of all kinds, solids, liquids, and gases, simple and compound, organic and inorganic, transparent and opaque. He found that every body examined was acted upon by the magnet, and he divided bodies into two classes: *Paramagnetic*, or those which were attracted by the magnet, and when in bars placed themselves axially (iron, nickel, chromium, and cobalt are notable examples); and *Diamagnetic*, or those which were repelled by the magnet, and when in bars placed themselves equatorially (bismuth, antimony, lead, tin, mercury, gold, silver, zinc, water, alcohol, flint-glass, sulphur, wood, &c.) He reduced all the actions of diamagnetic bodies when in the magnetic field to the simple law, that their particles tend to move into the position of weakest magnetic force. Experiments of this kind must be performed in vacuo, for the results are modified by changing the medium in which the body is suspended. Air is paramagnetic, and a body suspended in air appears less paramagnetic and more diamagnetic than it really is. If more feebly paramagnetic than air it will appear to be diamagnetic. Tyndall and others have investigated the action of magnetism on crystals. It seems that crystals, except those of the cubic system, are differently susceptible of magnetic induction in different directions, and that every crystal has either one line or one plane along which it is more susceptible of induction than any other direction. It is this line or plane which tends to place itself axially or equatorially, as the crystal is paramagnetic or diamagnetic. When a sphere is cut from a crystal its attraction or repulsion by a magnetic pole is a maximum when the direction of greatest induction coincides with the direction of the force. Tyndall found that the direction of greatest induction in crystals is closely related to the normal to the planes of cleavage, &c. To show that the direction of greatest induction in a body is that of closest proximity of its particles, Tyndall made a roll of powdered bismuth with gum water; it set itself, as a bar of bismuth would, between the poles of a magnet equatorially; when the roll protected by bits of pasteboard was squeezed flat in a vice, the plate so formed seemed like a magnetic substance, turning axially when placed between the magnetic poles: a roll of powdered carbonate of iron with gum water was paramagnetic until squeezed in the vice, when it appeared to be diamagnetic. In these cases the direction of greatest induction is the direction in which the pressure was applied. Tyndall says (Diamagnetism, p. 18), 'if the arrangement of the component particles of any body be such as to present different degrees of proximity in different directions, then the line of closest proximity, other circumstances being equal, will be that chosen by the respective forces for the exhibition of their greatest energy. If the mass be [para] magnetic, this line will stand axial; if diamagnetic, equatorial.'

MAGNETISM, ANIMAL. This name was given by Mesmer, in the latter part of the eighteenth century, to certain phenomena (not yet explained in an entirely satisfactory manner) produced by the action of one man upon another. The origin of the term was a fancied analogy between the action of the mineral magnet and that of the animal energy, or *vis vitæ*, to which these effects were attributed. Experience has shown the analogy to be unfounded. The principal means used to produce the effects of animal magnetism, are such as touching and stroking with the hands, according to rule (manipulation), breathing on a person, fixing the eyes upon him, &c.; the magnetized person must always be of a weaker constitution, and, if possible, of a different sex from the magnetizer; and it is indispensable that he should be of a disposition to believe without doubting. The phenomena themselves consist partly in bodily sensations (for instance, chilliness, heaviness, flying pains, oppressions, &c.), partly in a diminished activity of the external senses, partly in fainting, convulsions, sleep, with lively dreams (magnetic sleep), in which the magnetized person is said to be transported to higher spheres, observes the internal organization of his own body, prophesies, gives medical prescriptions, receives inspired views of heaven, hell, purgatory, &c., reads sealed letters laid on his stomach, and, when awakened, is totally unconscious of what he has experienced. At the same time the soul is alleged to become so elevated and refined that the magnetized individual has an instinctive perception of the presence of the impure, and falls into fits at the approach of disbelievers in animal magnetism, and of all who investigate it by the rules of ordinary reason. Hence it is necessary to keep sceptics at a distance when it is desired to witness the highest phenomena. The magnetized person shows a remarkable connection with, and dependence on, the magnetizer, and no one else can bring him back from the magnetic state. A scientific investigation of the influence which we are considering is hardly consistent with the views entertained of it by its adherents, for they maintain that mere reason cannot approach nor conceive this great mystery; it can be rightly apprehended only by a believer. The whole of its effects seem to be more or less ascribable to a heated imagination, to an excitement, half spiritual, half sensual, and to a morbid sensitiveness.

The phenomena of animal magnetism, in the case of the magnetizer and the magnetized, are stated by a writer on the subject to be as follows:—

1. *The Magnetizer.*—He is generally capable of producing a positive effect only so far as he possesses a higher degree of energy and vital power than the person magnetized. The man generally effects more than the woman. If the magnetizer is the weaker person there either takes place no apparent effect, or the effects are inverted, viz. the positive effects are apparent in him, and the negative in the person magnetized. If the magnetizer undertakes the manipulation of a susceptible subject, he always feels a glow, and the sensation of a gentle flow from his palm, and particularly from the points of his fingers. If he covers his hands with silk gloves, or other electric bodies, he has not this latter feeling, and his operation is fruitless; but linen or leather gloves do not prevent the effect. After a successful operation the magnetizer feels a general unpleasantness, a weakness in the nervous system, and, in general, a loss of power in proportion to the susceptibility of the magnetized subject, and the duration or frequency of the operation. If the magnetizer during the operation is isolated with the magnetized subject by electrical bodies, his loss of power is less, but the effects which he produces are stronger.

2. *The Somnambulist in the Person Magnetized.*—The phenomena said to be produced in the subject by a positive operation are of a double kind: either they have reference to the general state of the body, or they have reference only to particular activities of the organization. Of the former sort are: 1, a general awakening and strengthening of the vital powers in all parts of the body, without considerable excitement, as well as in the systems of the nerves and muscles, the vascular and digestive system, as the organs of secretion; 2, a mild excitement over the whole surface of the body, by which every irregularity and local reaction is neutralized and the equilibrium restored; 3, a withdrawing of the heightened vital power from the suffering organs to others; 4, a diminution or total suppression of the excitement producing the morbid activity of the nerves. The magnetizer not only should have a stronger body than the person magnetized, but also a perfectly healthy one. He must have attained the maturity of his bodily powers, but must still be within the age of active life; the mind, too, must be sound and strong, in order to master the affections and passions, to have a living faith and a firm will, and thus to attain perfect control over this means of cure, as also over the patient. The phenomena of animal magnetism have been divided into six degrees. Those of the first degree are generally the following: first, the feeling of a strong current from the head to the extremities, after which a higher degree of heat follows, easily observable by the thermometer, greater redness of the skin, with increased perspiration, and a feeling of ease and comfort throughout the whole body. In the second degree the patient feels a heaviness in the eyelids, and an irresistible desire to close them. If he does close them they seem to him cemented by the strongest power, and during the remainder of the magnetic effects it is impossible for him to open them. All the other senses, however, remain active, and their activity is often heightened. The patient knows, therefore, everything which is done about him, though he is not always capable of speaking. The particular signs often accompanying the third degree are, especially, swoons, convulsive tremblings, real convulsions, cataleptic and even apoplectic fits. This state generally begins with all the signs of an approaching drowsiness. Repeated yawning, stretching, heaviness of the eyelids, announce it. A deep sigh generally follows, after which the eyes close entirely, and a state begins similar to sleep, in which the patient seems to be deprived of all sensation and consciousness. In the fourth degree the patient awakens, not from his sleep, but within himself, and regains his consciousness; he knows himself again, yet in a changed relation to surrounding circumstances. The external senses are either closed entirely, or their character is changed, and the internal sense only remains the same. The sense of feeling is metamorphosed into that of seeing, so that the somnambulist can distinguish by it, not only the outlines of things, but also colours, with perfect precision. The region of the stomach becomes the central point of all sensation, and it is chiefly through this region that the sense of sight is supplied. The somnambulist, therefore, can ascertain the time perfectly well by a watch closely held to the pit of the stomach. Hearing is likewise performed in this state by the pit of the stomach. Of everything which has occurred to the patient during this period, what he has perceived, thought, said, or done, he has, when awaking, either no recollection or a very faint one; but if he is brought again into this state he recollects everything very well. In the fifth degree the patient attains, by his heightened consciousness and the increased strength of his general feelings, to that internal self-contemplation by which he is able to investigate even the minutest parts of his bodily structure. By virtue of this accurate knowledge of his internal frame the clairvoyant, as he is called in this state, not only determines very distinctly the seat and quality of his disease, but at the same time an instinct develops itself in him, which makes him understand the means necessary for his cure. This deep insight extends to persons brought into magnetic relations with him, whose sensations are always communicated to him. The magnetic sympathy may be so far heightened that the clairvoyant has a clear insight into the internal physical state of persons in a magnetic connection with him, just as he has of his own; can determine their disease, its course, and future phenomena, and prescribe the means of cure accordingly. The patient who has attained internal clearness by the fifth degree penetrates, in the sixth degree, the darkness of external things, and attains a higher view of the whole of nature. With uncommon clearness he often distinguishes the secrets of the past, what is distant and unknown in the present, and the events of coming time. And in respect to the choice of proper remedies, the clairvoyant is less limited than before. In the former degree it was necessary to put him into connection with another person by intermediate bodies; but in this degree he can be in this relation with any distant person, if he knows him, or feels a lively interest for him, or even if the magnetizer, or any other person brought into connection with the clairvoyant by actual touch, knows the distant person, and thinks intently of *him*. The view of the clairvoyant extends even into the future condition of others. In this degree he attains to a higher, fuller life than he had before. The body seems to be intimately amalgamated with the mind, to be blended into the most harmonious union with it. The individual is removed from everything coarse and sensual, and placed in a state of serene and elevated self-contemplation. The feeling of the greatest bodily comfort and purity of soul produces a serene peace within him, which expresses itself in the nobler expression of the whole body. In this state, which, according to the clairvoyants, borders on heavenly felicity, they are incapable of impurity, and even the guilty obtain the feelings of virtue.

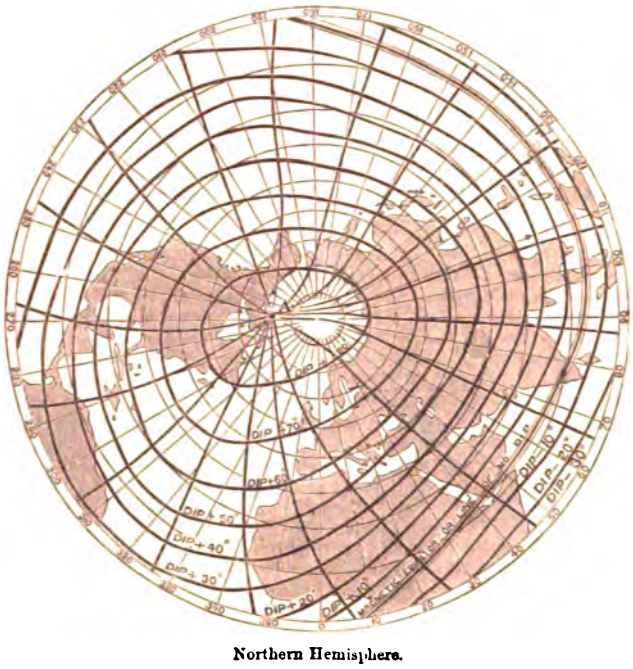
Such are the alleged wonders of animal magnetism, of which our readers may believe much or little. The attention which the subject has attracted in Europe is our excuse for the length of this article. Apart from all mysterious influences or principles, such as the absolute believers in animal magnetism have claimed to be the causes and sources of these phenomena, we may find in the action and relations of the mind and nervous system the true explanation of many otherwise inexplicable occurrences. True it is that the most intimate relations of the mind and nervous centres have not yet been determined, but this very ignorance affords a powerful argument in favour of our refusing to believe in the mysterious when the investigation of the real will fully explain all. Many of the most common mental phenomena have not received from metaphysics or psychological science their explanation. And to allot to the province of mystery what is sure material for the scientific investigators of the future is a method of proceeding which carries its own condemnation with it, in its manifest absurdity and unreasonableness. Certain observers, admitting their present helplessness to explain such mental phenomena as those upon which animal magnetism rests, have yet endeavoured to simplify the probable cause of the phenomena, by assuming the existence of a

so-called *nerve* or *psychic force*. And they believe that through the operation of this force—which is held to be merely an unusual manifestation of nervous influence—the phenomena of magnetism, &c., are produced in one individual through the nervous action and influence of another individual. Of late years the phenomena of *spiritualism* have usurped the place in popular attention formerly occupied by animal magnetism and mesmerism. The former and newer 'mystery' appears infinitely more than even the latter phenomena to be invested with the jargon and to be dependent on the conjuring arts of quacks and impostors. And this latter remark is well exemplified in the unwillingness with which any scientific investigation has been permitted—the condition imposed upon would-be investigators by the spiritualists and others, rendering their own *modus operandi* at once difficult of detection, and the success of the man of science almost or entirely hopeless. Hence the refusal to submit to the most universally recognized and simplest conditions for scientific investigation (for example, presence of light and apparatus) has shown fully the absurd and ideal or false nature of all the so-called phenomena of spiritualism. And when we consider that professed conjurors are able to imitate exactly, and under similar conditions, many or all of the phenomena alleged to be dependent upon mysterious and unknown influences, these latter pass thus from the domain of natural and scientific phenomena to that of the quack and conjuror. Fed by popular excitement and the never-dying crave for 'something new,' such exciting phases of pseudo-science and mystery have their day and measure of success with the few. But they have also their evil day and decline—an event never to be deplored by all who value the moral as well as the physical health of society at large. For those who desire a good scientific account of the more aberrant functions of the mind we may recommend Carpenter's Principles of Mental Physiology and Principles of Human Physiology, in which the writer endeavours to account for many of the various phenomena by the theory of a dominant idea exciting and governing all other mental operations. Of works on animal magnetism we may mention Colquhoun's Inquiry into the Origin, Progress, and Present State of Animal Magnetism; Letters on Animal Magnetism, by Professor W. M. Gregory; Truths in Popular Superstitions, by Dr. Herbert Mayo; Dr. Rudolf Heidenhain's Animal Magnetism (translated by Wooldridge, with a preface by G. J. Romanes), London, 1880.

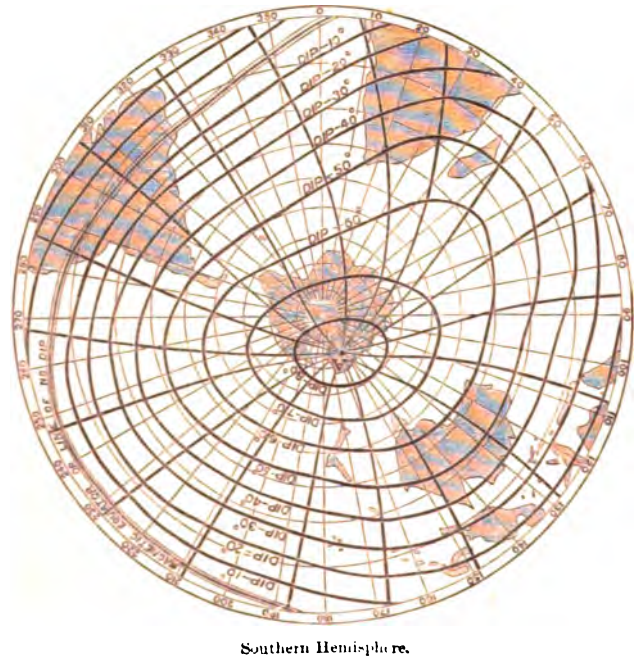
MAGNETISM, TERRESTRIAL, a subject which treats of the mapping of the lines of force (giving direction and intensity of force at all places) of the magnetic field surrounding the earth. The direction of magnetic force at any place is known when the declination and inclination (or dip) have been measured by means of the declinometer and dipping needle. (See these four articles.) The total force with which a unit magnetic pole would be moved along a line of terrestrial magnetic force may be resolved (see MECHANICS) into a horizontal and a vertical component. When the horizontal component of the force and the dip are measured at a place the total force may be calculated for it is equal to the horizontal force divided by the cosine of the dip. To determine the horizontal component an ordinary declination needle (a needle suspended so as to move freely horizontally) is allowed to oscillate about its position of rest; on counting the number of oscillations per second at different places we are able to calculate the relative amounts of the horizontal force, just as the rates of vibration of a pendulum at different places determine the relative amounts of the force of gravity. (For Gauss' method of determining the force in absolute units, see MAGNETOMETER.) The declination, dip, and intensity of magnetic force at any place are called the *magnetic elements* of the place. Halley in 1701, and afterwards Hansteen, Rossel, Barlow, Ross, Sabine, and others, published charts giving the magnetic elements at many places on the earth. Humboldt in 1819 applied to several governments for aid; magnetic observatories were established at Toronto, Hobart Town, the Cape, St. Helena, and at a number of places in the Russian Empire. The most famous magnetic observatory was that at Göttingen under the direction of Gauss and Weber. To Gauss is due the invention of all the most delicate instruments and of the most perfect methods of observing and co-ordinating the phenomena. Colonel Sabine and a staff of military assistants had charge of the foreign observatories of Great Britain; all the observations were made simultaneously every hour, and sometimes more frequently, and were regulated by Göttingen mean time. Sabine published the observatory results, and also the results of certain voyages and expeditions. His charts of isogonic, isoclinic, and isodynamic lines are given in Johnston's Physical Atlas. The *isogonic* lines, or lines drawn through places in which the declination is the same, seem to terminate in two points, one to the west of Baffin's Bay, the other south of Australia. Two of these lines, drawn through places where there is no declination, so that the needle indicates the true north, are called *agonic* lines; one passes through the South Atlantic, Brazil, North America near New York, the great lakes, and to the west of Baffin's Bay; the other passes from the White Sea to the Caspian and east coast of Arabia, thence through the Indian Ocean to the west of Australia, where it again turns south. The *isoclinic* lines, or lines drawn through places at which the dip is the same, correspond to, but are not so regular as, the parallels of latitude. With the magnetic meridians they are represented in the figures on next page, which thus furnish a complete specification of the directions of the lines of force of the earth's magnetic field. The *aclinic* line, or line of no dip, corresponds to the geographical equator, which it cuts at two points; one in Africa and another to the west of South America. The magnetic poles, or places where the dip is 90°, are situated one (according to Captain Ross, 1831) in 70° 50′ N. lat. and 263° 14′ E. lon.; the other (as calculated from observations at Hobart Town) in 66° S. lat. and 146° E. lon. The isoclinic lines may be regarded as concentric curves round the two poles. The *isodynamic* lines, or lines drawn through places where the total intensity of magnetic force is the same, are nearly parallel to the isoclinic lines. There are, however, two points of maximum intensity in the northern hemisphere, one about 16° south of the magnetic pole, the other in Siberia. Gauss shows that the number of points of maximum intensity on the earth must be odd, in fact that there are three, so that in the southern hemisphere there is only one such point, and he finds from a calculation that it is 2° 26′ to the north and 7° 56′ to the east of the south magnetic pole.

The magnetic elements at any observatory are found to vary from time to time. The declination at London was 11° 15′ E. in 1576, 0° in 1652, 19° 30′ W. in 1760, 24° 27′ W., its maximum, in 1815, 21° 6′ W. in 1865, 19° 15′ W. in 1870, and it still decreases. The dip at London was 74° 42′ in 1720, 70° 35′ in 1800, 68° 9′ in 1865, 67° 55′ in 1870, and is decreasing regularly at present at the rate of 2·6′ per annum. We have reason to believe that the dip, like the declination, will reach a minimum value and then begin to increase. Besides the above *secular* variations

there are *diurnal* and *annual* variations. Thus at Kew at about 8 A.M. the declination is 4′ less than its mean value; at 10 A.M. and 7 P.M. it reaches its mean value; and at 1 P.M. it is 8′ greater than the mean. At Kew from April to July the declination decreases, and from July to April it increases. There are also annual and diurnal variations of the dip; the variations of intensity are very slight. There are also very irregular temporary variations, called *magnetic storms;* they 'are not connected with thunder-storms or any other known disturbance of the atmosphere, but they are invariably connected with the exhibition of aurora borealis and with spontaneous galvanic currents in the ordinary telegraph wires; and this connection is found to be so certain that upon remarking the display of one of the three classes of phenomena we can at once assert that the other two are observable (the aurora borealis sometimes not visible here, but certainly visible in a more northern latitude)' (Airy on Magnetism, p. 204). Sabine has shown that there are periods of greatest frequency of the magnetic storms every ten years, and that these are the times at which there is the greatest number of spots on the sun.



Northern Hemisphere.



Southern Hemisphere.

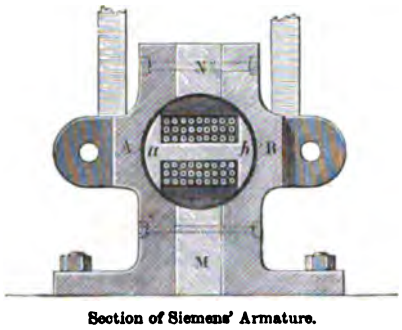
Gilbert (sixteenth century) supposed the existence of a large magnet inside the earth, whose poles were near the geographical poles. Halley explained observed facts by the supposition of the existence of two magnets of unequal strength crossing each other at the earth's centre. Barlow explained them by supposing the existence of electric currents passing round the surface from east to west. The hypothesis of a small magnet of great power inside the earth explains the fact that the tangent of the dip is always nearly the same as twice the tangent of the magnetic latitude, and that the total force at the poles is (roughly) equal to twice the force at the equator; but there are many observed facts which it leaves unexplained. The hypothesis of two magnets has been well worked out by mathematicians, but it also is unsatisfactory. Gauss put aside all hypotheses of this nature; he calculated what must be the irregular distribution of magnetism in the earth to produce the observed phenomena. Expanding the three forces, northward, eastward, and upward, which act on a pole at any place, in infinite series, by means of Laplace's co-efficients and equation, he finds that the magnetic potential at any place on the earth may be expressed in terms of constants determined from a number of observations of the magnetic elements at different places. Professor Clerk Maxwell, following Gauss, expands the expression of the magnetic potential at any place in a series of spherical harmonics; he finds the effects due to causes external to the earth and also the internal causes; the former are very small.

As the mariner's compass (see COMPASS (MARINER'S), and COMPASS) indicates the magnetic north, to determine the direction of the true north it is necessary to find from a chart the declination at the

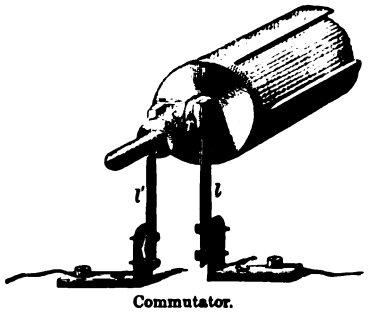
place where the ship is. The neighbourhood of magnets and pieces of iron will cause a *deviation* of the N.S. line of the compass card from the magnetic meridian; care in placing the compass will usually prevent any material deviation from the iron used in constructing wooden ships. In an iron ship many of the beams have become magnetic by the earth's induction during building, and some become magnetic when at sea, or have a temporary magnetization depending on the direction of the ship's head. Good practical results are obtained by considering part of the iron of a ship to be hard, and therefore permanently magnetized, and part to be soft, its temporary magnetism being due to the induction of the earth and of the permanent magnets of the ship. The sub-permanent magnetism produced during building and the wave-buffeting of a first voyage dies away in a short time; and although some annoyance is caused in the first voyage from the unknown amount of this sub-permanent magnetism, it may practically be neglected afterwards. A magnet suitably placed nullifies the deviation due to the permanent magnetism of the ship. The temporary magnetism, which alters when the course of the vessel is altered, can be partially compensated by erecting a soft iron structure near the compass. The vessel is *swung* in port, that is, she is headed in all directions, and in every direction the deviation is noted in a book which is consulted for corrections during the voyage. It is evident, however, that these noted deviations are exactly true only for one particular place. The temporary magnetism varies as the ship rolls, and more slightly when she pitches. Professor Fleeming Jenkin refers readers to The Admiralty Compass Manual, by A. Smith and Captain Evans, R.N.

MAGNETO-ELECTRICITY treats of the currents of electricity produced in a conductor when its position is changed relatively to a magnetic field (see INDUCED CURRENT), whereas electro-magnetism (which see) treats of magnetization produced by currents.

MAGNETO-ELECTRIC MACHINES. In Clarke's machine (fig. 11, Pl. LXII.) B is a permanent steel magnet; in front of the poles of this magnet two bobbins of insulated wire may be rotated about a horizontal axis by means of a pulley at A and a wheel R. The wires of the bobbins are joined, and form only one circuit, a current of electricity being able to pass round one bobbin in a right-handed direction, and round the other in a left-handed direction. The bobbins have two soft-iron cores, joined together by means of an iron strap seen in the figure. The two ends of the wire are attached to contact pieces on the axis, and these rub on springs X and Y. When the circuit is completed by joining X and Y, and the bobbins are rotated, a current of electricity passes, and may be used to decompose water as in the figure, or for an electric light, shocks, or telegraphic messages. When a bobbin approaches a pole of the magnet a current is sent through it (see INDUCED CURRENT), and when it leaves the pole a current is sent through it in the opposite direction; the currents are always flowing in both bobbins in the same direction at the same time, because the wire has been wound round them in opposite directions. Thus during half a revolution currents flow in one direction through the bobbins, and in the next half-revolution the direction of the currents is reversed; these two opposite currents are caused by the contact pieces and springs (the commutator) to flow at all times in the same direction in any wire joining X and Y. M. Nollet of Brussels invented a machine in which a frame containing a number of bobbins revolves in a frame containing a number of permanent magnets. One of these machines, constructed by Mr. T. Holmes, produces the electric light of the South Foreland Lighthouse. Eighty-eight bobbins of wire are fixed in the rims of two wheels 5 feet in diameter; the axes of the bobbins are parallel to the axis of rotation of the wheels. Twenty-two horse-shoe magnets are fixed in each of three circular frames. The magnets are so arranged that each bobbin passes in one revolution of the wheel between forty-four pairs of opposite poles. By means of contact pieces and springs the induced currents are all sent in the same direction between a pair of carbon points. Forty-four distinct currents are produced in each core in one revolution; the currents from all the cores are combined in such a way that the current between the carbon points is of nearly constant strength. A steam-engine of 1½ indicated horse-power drives the machine. The soft-iron cores of the bobbins are in the form of split tubes, to facilitate sudden demagnetization. Increased rapidity of revolution would produce stronger and stronger currents without limit only for the coercitive force of the iron. (See INDUCTION (MAGNETIC), INDUCED CURRENT.) The most efficient rapidity is found to be 110 revolutions per minute. Messrs. Siemens' armature, shown in the accompanying figures, is now employed instead of ordinary bobbins in many magneto-electric machines. Instead of the wires being coiled in circles each coil is a very long rectangle with rounded corners. From one end to the other this bobbin is embraced by the poles of a large magnet or of a number of small magnets, so that it revolves in a small and most intense magnetic field. In Wilde's machine the current produced by the revolution of a Siemens' armature *r m o n* between the poles of a number of small permanent magnets M magnetizes a large electro-magnet A B, between the poles of which a second larger Siemens' armature F T i T rotates; the current from this second armature is utilized. In dynamo-electric machines the electro-magnet always retains sufficient

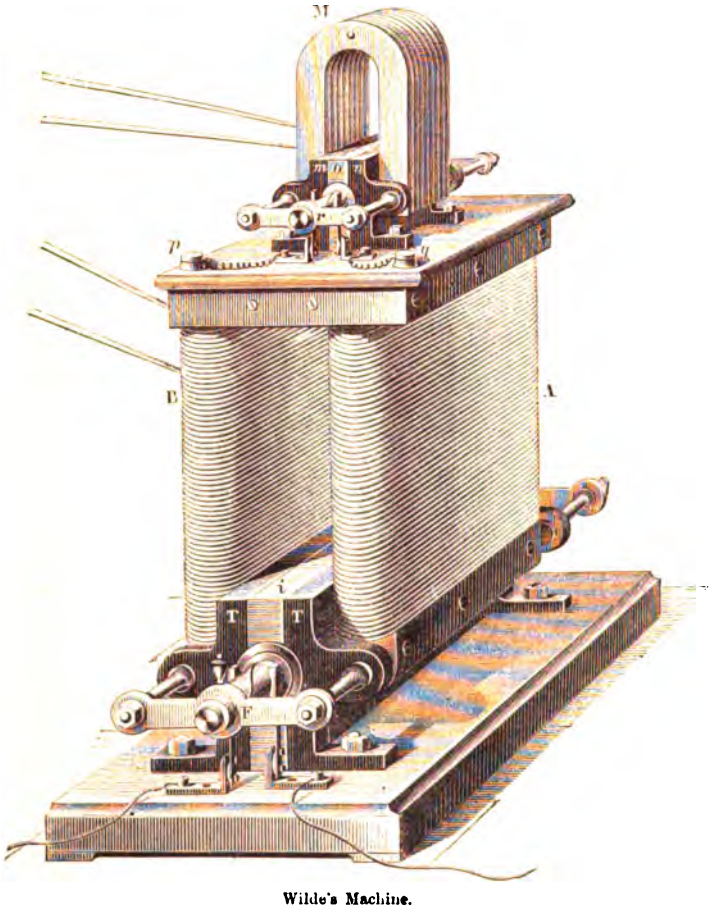


Section of Siemens' Armature.



Commutator.

magnetism to create a feeble current when a Siemens' armature is rotated between its poles; this current passes round the electro-magnet, whose magnetism gets greater and greater to a limit as the rotation is continued. The current therefore gets stronger and stronger, and part of it may be diverted into an external circuit for utilization. Telegraphic signals may be sent by the motion of a Siemens' armature in one direction or the other between the poles of a steel magnet. Magneto-electric currents pass from the armature to a distant station, and by the help of a polarized relay (see TELEGRAPH) will even work a Morse's ink-writer. In Wheatstone's universal telegraph the signals are made by means of magneto-electric currents.



Wilde's Machine.

MAGNETOMETER, an instrument employed in observatories to measure the intensity of terrestrial magnetism. A magnet may be allowed to move freely in a horizontal plane by being supported on a fine vertical pivot, or by suspension on a fine untwisted silk thread. Bifilar suspension is more to be depended upon; the magnet is supported by two parallel threads; screws enable the tensions in the threads to be equalized and their distance asunder to be adjusted. An investigation of bifilar suspension will be found in Clerk Maxwell's Electricity, art. 459. The angular position of a magnet is often determined by pointing the ends and observing their positions relatively to marks on a card placed underneath. (See DECLINOMETER, DIPPING NEEDLE.) Another method is to attach to one end of the magnet a lens through which a scale engraved on glass and attached to the other end may be viewed by means of a telescope. Again, a plane mirror may be attached to the magnet; the divisions of a fixed scale may be viewed by reflection by means of a telescope placed just over the centre of the scale at a distance from the magnet. (See Clerk Maxwell, art. 450.) When the moment of inertia (see MOMENT OF INERTIA) of the suspended magnet is known, its rate of oscillation about its position of rest in the magnetic meridian enables us to calculate the product of its magnetic moment (see note to article on MAGNETISM) and the horizontal component of the earth's force. The ratio of these two quantities may be found (1) by placing the magnet at right angles to the meridian, and observing the deflection from the meridian which it causes in a small suspended magnet at a distance; or (2) by suspending the small magnet from an arm with which the large magnet can revolve, and observing the greatest deflection produced in the small one when the arm is moved, or by other arrangements of magnets adopted to eliminate the effects of change in their magnetization as the magnets are moved. The mathematical investigation of these methods of Gauss to determine the absolute intensity of the earth's force will be found in Clerk Maxwell's Electricity, art. 453–464. Commonly only the *changes* in the intensity of the earth's magnetic force are measured in an observatory. A magnet with bifilar suspension is held by the two threads in a position nearly at right angles to the meridian; its deviations from a position at right angles to the meridian are measures of changes in the horizontal intensity. Changes in the vertical intensity are measured by means of a magnet placed in the meridian, and suspended on knife-edges like the beam of an ordinary balance; its deviations from horizontality are observed.

MAGNIFICAT. The words which Mary pronounced when she visited Elizabeth (contained in Luke i. 46–55) begin in the Vulgate, 'Magnificat anima mea dominum' (My soul doth magnify the Lord). Hence the whole of her thanksgiving on this occasion has been called the *magnificat*. The present usage of the Roman Catholic Church is to chant or pronounce the magnificat every day at vespers. It has often been set to music, and forms part of the musical cyclus of the Roman Catholic Church. It is also used by Protestants, and forms part of the evening service of the English Church. In the Roman Catholic Church the music of Palestrina is seldom attempted to be superseded, but new compositions are not uncommonly written.

MAGNIFYING-GLASS. See Microscope.

MAGNIFYING POWER. When an object is viewed through a lens or a microscope the magnifying power of the optical instrument is defined as the ratio of the angle which the image subtends at the eye to the angle which the object would subtend at the eye if it were in the position of the image and viewed directly; this is really the ratio of the linear magnitudes of the image and object. The magnifying power of a microscope depends on the character of the lenses and on their distances asunder. To determine it experimentally a small glass plate, on which is scratched a series of parallel lines at distances of $\frac{1}{10}$th of a millimetre is placed in front of the object-glass; instead of viewing this through the microscope directly, the rays of light are reflected from a piece of unsilvered glass (inclined in front of the eye-piece at an angle of 45°) to the eye; on a screen behind the glass there is a scale divided into millimetres; the magnifying power of the microscope is known from the size of the image as shown by the scale. When an object is viewed through a telescope the magnifying power of the instrument is estimated as the ratio of the angle which the image subtends at the eye to the angle which the object would subtend if viewed directly. The magnifying power of an ordinary astronomical telescope, or of Galileo's telescope, or an opera-glass, is the focal length of the object-glass or reflector divided by the focal length of the eye-glass. It may be determined roughly by looking at a distant object directly with one eye and through the telescope with the other.

MAGNOLIA (natural order Magnoliaceæ). The magnolia-trees are much admired on account of the elegance of their flowers and foliage. Their leaves are alternate, petiolate, and in one species evergreen; and their flowers are large, white or yellowish, solitary at the extremities of the branches, and in some species very fragrant; the leaves and wood are also more or less aromatic. They abound in North America, and are much cultivated in our gardens. Their wood in general is soft, spongy, and of no great utility. They inhabit the United States and the south-eastern portion of Asia. The *M. tripetala*, or *umbrella-tree*, so called from the disposition of the leaves in a radiated manner towards the extremity of the branches, inhabits the whole extent of the Alleghanies. The leaves and flowers are very large, the latter having from nine to twelve white petals, the three exterior ones being reflexed.—The *M. acuminata* inhabits the same districts as the preceding. It is a lofty tree, attaining the height of 80 feet, with a proportional diameter. The flowers are inodorous, and have from six to nine petals of a greenish-yellow colour.—The *M. macrophylla* is remarkable for the size of its leaves and flowers. The former are between 2 and 3 feet long, and the latter are upwards of a foot in diameter. The petals are from six to nine in number, and the three exterior ones have a purple spot at the base.—The *M. grandiflora*, or big laurel, is confined to the lower parts of the Southern States from North Carolina to Florida and Louisiana. It is a lofty and magnificent tree, with large evergreen leaves and white flowers, which are conspicuous at a great distance.

MAGNUSEN, Finn, one of the most distinguished of northern archæologists, born of an ancient and noble family at Skalholt in Iceland in 1781. He early showed strong inclinations for study, and in 1797 entered the University of Copenhagen, where he devoted himself chiefly to poetry, history, and antiquities, though he had resolved to make the law his profession. After his return to Iceland in 1803 he commenced practice at Reykjavik as an advocate, and continued it till 1812, when he again proceeded to Copenhagen. Here he again devoted himself to his favourite pursuits, and succeeded in 1815 in obtaining a chair. In 1819 he was appointed to deliver lectures in the university and the Academy of the Fine Arts on ancient northern literature and mythology. How well he executed this task appears both from his View of the most Ancient Abode and Emigrations of the Caucasian Race (1818), and his Contribution to Northern Archæology (Copenhagen, 1820). The most important of his other labours are a Translation and Commentary on the Ancient Edda (Aldre Edda, oversat og forklaret, four vols. Copenhagen, 1821–23); a View of the Whole Doctrine of the Edda (Eddalaren og dens Oprindelse, four vols. 1824); and a great Runological work entitled Runamo og Runerne (1841). He also produced, in conjunction with Rufn, a work on the Historical Monuments of Greenland, published in three vols. (Copenhagen, 1838–45). From 1835 he faithfully discharged the duty of deputy to Denmark from Iceland and the Faroe Isles, and died at Copenhagen in 1847.

MAGOG. See Gog.

MAGOT. See Barbary Ape.

MAGPIE (*Pica caudata*). This well-known Insessorial bird is included in the family of the true crows (Corvinæ). It belongs, therefore, to the Conirostral or 'conical-beaked' section of the perching birds, and averages about 18 inches in length, weighing from 8 to 10 oz. The beak, wings, and tail are black; the wings especially, and the tail also, being variegated with white, and with shades of blue, purple, and green. The tail is elongated, and by this character alone the magpies are distinguished from the ordinary and allied crows. The nest is constructed with great art—this feature also showing a difference from the crows, the nests of which are built without much elaboration or care. The magpies build in thick hedges, but more commonly in trees; the nest being oval and completely covered in by thorny twigs, which effectually protect and conceal it. The entrance to the nest exists in the side of the structure; whilst internally its sides are lined with mud; the bottom being covered with a layer of soft grass and plant materials, so as to fit it for safely containing the eggs and forming a comfortable home for the young. The eggs are from five to seven in number, and are of a pale-greenish colour, closely spotted with black. These birds breed in the spring. Their food consists of both animal and vegetable matter, although the magpies feed less upon carrion than the crows. The feeble young and eggs of other birds are attacked and devoured by the magpie, and in this instance the predatory and carnivorous tastes of these birds become exemplified. In rural districts the magpie was formerly regarded with somewhat of a superstitious fear, and even in the present day, from its talking habits, and particularly from its thieving propensities, it is still regarded with some degree of disfavour. When domesticated it readily learns to repeat words, and even short sentences, but possesses a natural talent for the imitation of all kinds of sounds. In the classical times this faculty was known, for Plutarch gives an account of a talking magpie which belonged to a barber in Rome. The magpie, like the jay, is exceedingly fond of acquiring articles of jewelry, and other objects of a bright or shining appearance. These objects are generally secreted in the nest, and on more than one instance the story of the Maid and the Magpie has received illustration, on account of innocent persons being charged with the theft of articles which these birds had appropriated. Goldsmith thus sums up the character and disposition of the magpie:—'Were its other accomplishments equal to its beauty few birds could be put in competition. Its black, its white, its green and

purple, with the rich and gilded combinations of the glosses on its tail, are as fine as any that adorn the feathered tribe. But it has many of the qualities of a beau to depreciate these natural perfections: vain, restless, loud, and quarrelsome, it is an unwelcome intruder everywhere, and never misses an opportunity, when it finds one, of doing mischief.'

MAGYARS, the original name of the Hungarians, and which they still use in preference to any other. See HUNGARY.

MAHÂBHÂRATA. See SANSKRIT LANGUAGE AND LITERATURE.

MAHÂNADI (or MAHANUDDY) RIVER, a river in Southern Hindustan. In the early part of its course it drains the fertile plain of Chattisgarh in the Central Provinces; flows south-east and then east through the province of Orissa, past Sambalpur and Cattack, and falls into the Bay of Bengal by two mouths, after a course of about 530 miles. During the rains it is navigable 300 miles up from its estuary, but a large portion of its channel is dry during five or six months of the year. Diamonds are found in it and in several of its tributaries.

MAHÉ, an island in the Seychelle or Mahé Archipelago, in the Indian Ocean, about 17 miles long and 4 miles broad. It attains an elevation of about 2000 feet above the level of the sea, from which it rises in most places nearly perpendicularly; it abounds with wood, and may be seen from a distance of 36 or 40 miles. Its east side is bordered by extensive reefs of coral, the openings of which, opposite St. Anne Island, form the port of Mahé, which is capable of holding five or six large ships of war moored, with sufficient room for small vessels. There is here a village called Victoria, the only one on the island. Wood and water may be obtained here, and supplies of cattle and rice.

MAHÉ, a town and fort, Southern India, in the province of Malabar, 40 miles N.N.W. Calicut, at the mouth of a small river, navigable for boats a considerable way inland. It is a neat town, was formerly the chief French settlement on the western side of India, and is still in their possession. Pop. 8492.

MAHMUD, Sultan of Ghazna, the founder of the Mohammedan Empire in India, and one of the greatest conquerors of the East, was born at Ghazna about 970. He was the son of Sebektegin, a Turki slave, who became the son-in-law and successor of Alptegin, also a slave of the Caliph of Persia, who founded an independent dynasty at Ghazna. During the life of his father he took part in warlike expeditions, and received from the Persian Caliph the government of Khorasan. On the death of Sebektegin (997) he was succeeded by his son Ismael, Mahmud, though the eldest son, being illegitimate. Mahmud disputed the sovereignty with Ismael, defeated him, and imprisoned him for life. He then took the title of sultan, which had not yet been assumed by any Turkish ruler. His first enterprise was to assist the Tatar ruler Elik Khan in effecting the overthrow of the Samani dynasty in Persia. He then turned his attention to India. His father had already been engaged in a war with India, in which Mahmud had distinguished himself, through the aggression of the Rajah Jeipal of Lahore. In his first expedition Mahmud defeated Jeipal and took him prisoner. In the second (1004) he captured, after a fierce struggle, a city called Bhatea. In 1005 he defeated Anangpal, the successor of Jeipal, near Peshawar. He was compelled to hurry home by an invasion of the Tatars under Elik Khan, who threatened to subdue Khorasan. He defeated Elik with the aid of 500 elephants brought from India, and drove him across the Oxus. This accomplished, he returned to India. Anangpal, with the assistance of a powerful coalition of rajahs, had assembled one of the largest armies yet seen in the Panjab. Mahmud did not venture to attack him, but waited to be attacked in his entrenchments. He was again victorious, and carried away enormous spoils from the Temple of Nagarcot (1008). On his return he celebrated a triumph at Ghazna. In 1010, after subduing Ghor in the Hindu Kush, he resumed his conquests in India, captured Multan, plundered the Temple of Tanesar, and continued for a series of years to extend his conquests in successive expeditions. These for a time were interrupted by his conquest of Transoxiana, effected in 1016. In 1017 he set out at the head of an army of 100,000 foot and 20,000 horse, passed the Jamna, and turning to the south appeared before Canouj, the largest and most magnificent Indian city of the day, the rajah of which took precedence of all the Indian rajahs. As the Rajah of Canouj at once submitted it was spared from pillage, a fate to which Mattra, a famous religious city, was subjected without restraint for twenty days. Mahmud wrote home that this city possessed a thousand edifices, mostly of marble, as firm as the faith of the faithful. In 1023 he annexed the territories of Jeipal II., who had revolted, and established for the first time a permanent Mohammedan garrison in Lahore. His last, which is usually called his twelfth, expedition into India (1024–26) was directed against Gujerat. He took the capital and changed the government, but the chief attraction was Somnáth. The magnificence of its temple filled him with wonder, and the descriptions of it suggest images of the palace of Aladdin. Its lofty roof was supported by fifty-six pillars carved and glittering with precious stones. It was lighted by a lamp suspended from the centre by a gold chain. A huge idol, which Mahmud broke, was found hollow, and disclosed immense treasures in diamonds and precious stones. The pieces of the idol were sent to Mecca, Medina, and Ghazna. The gates of Somnáth are also said to have been carried away, but this story rests on tradition, and its authenticity is doubtful. At all events they were restored. (See ELLENBOROUGH.) He made his way home with difficulty after a delay caused by a sort of naval warfare with the Juts, a tribe occupying a district intersected by rivers containing numerous islands in the neighbourhood of Multan, where he halted, and built 1400 boats to chastise their aggressions upon his army. The remainder of his enterprises were confined to the west of the Indies. Mahmud was avaricious, and loved to accumulate treasures from his warlike expeditions. Two days before his death, it is said, he caused his treasures to be brought before him, and wept over them: the next day he reviewed his troops, and the thought of parting with them caused him again to burst into tears. He died 29th April, 1030.

MAHOGANY, the wood of the *Swietenia mahogoni*, a lofty and beautiful tree, indigenous to Central America and the West Indies, belonging to the natural order Cedrelaceæ, and one of the most valuable of tropical hardwood trees. The leaves are pinnate, composed of four pairs of oval, acuminate, entire leaflets, and destitute of a terminal one. The flowers are small, white, and are disposed in loose panicles. The fruit is a hard, woody, oval capsule, about as large as a turkey's egg. The wood is hard, compact, reddish-brown, and susceptible of a brilliant polish. It is one of the best and most ornamental woods known, and is of universal use in the making of furniture. It is imported chiefly from Mexico and British Honduras. In 1882, out of a total of 36,478 tons imported into Great Britain, Mexico sent 19,444; Honduras, 10,173; Central America, 2799; Spanish West India Islands, 1910; all other countries, 2152.

The tree is of rapid growth, and its trunk often has a diameter of 4 feet. Mahogany-cutting constitutes a principal occupation of the British settlers in Honduras. Gangs of negroes, consisting of from ten to fifty each, are employed in this work; one of their number is styled the *huntsman*, and his duty is to traverse the woods in search of the trees. When these have been discovered a stage is erected against each, so high that the tree may be cut down at about 12 feet from the ground. After the branches are lopped the task commences of conveying the logs to the water's side, which is often a work of considerable difficulty. They now float down the current singly, till they are stopped by cables which are purposely stretched across the river at some distance below. Here the different gangs select their own logs, and form them into separate rafts preparatory to their final destination. In some instances the profits of this business have been very great, and a single tree has sometimes been known to have produced about £1000. Mahogany is said to have been introduced into Britain about the year 1724.

MAHOMET. See MOHAMMED.

MAHON, or PORT MAHON (ancient *Portus Magonis*), a city and port of Spain, on the east side of the Island of Minorca, of which it is the capital, at the head of a capacious bay, which forms one of the best harbours in Europe. It is generally well built, having wide, though in many instances steep and badly-paved streets. Fishing, fish-curing, agriculture, and cattle-rearing employ the bulk of the inhabitants. In the bay are several rocky islets, on one of which stands an arsenal, on a second a lazaretto, and on a third a naval hospital. Its entrance is commanded by the fort of San Felipe. It exports brandy, wine, dried fruits, agricultural produce, &c.; and imports grain, wearing apparel, tobacco, sugar, coffee, cacao, leather, hats, and other manufactured goods. Pop. 15,842. Port Mahon was occupied by the English in 1708. It was taken from them after a memorable siege by the French under Marshal Richelieu on 28th June, 1756. Admiral Byng was shot for failing to relieve it. It was restored to the English in 1763, and taken by the Spaniards in 1782. It was retaken in 1798, and finally given up to the French by the Treaty of Amiens in 1802.

MAHRATTAS, a native Hindu race, said to have migrated from Northern India, who in the reign of Shah Jehan occupied a tract in the middle portion of Hindustan, stretching from the mountains forming the watershed of the Narbada and Tapti on the north to Goa on the south. Here in a land of mountains, forests, and natural fortresses, they had long exercised the vocation of freebooters, and had spread wide the terror of their name. The neighbouring powers, particularly the rulers of Ahmednagar, Bijapur, and Golconda, had found it expedient to employ them as soldiers in their frequent wars, and thus increased their opportunities of pursuing their lawless life. On the fall of the Kingdom of Ahmednagar the Mahratta chiefs, nominally under the King of Bijapur, took care to secure a share of the spoils. Sevaji, the son of a chief called Shaji, assumed the charge of his father's jaghir in the Kingdom of Bijapur (1647), threw off the authority of his father and of the King of Bijapur, made himself master of the greater part of the territory above described, and after many vicissitudes in his collisions with the Mogul emperors extended his conquests over the Southern Concan into Mysor and in other directions, had himself crowned king in 1674, and established the Mahratta Empire. Sevaji's successor, Sambaji, was taken prisoner and put to death by Aurengzebe in 1689. After his death long minorities and the incompetency of the sovereigns caused the powers of the state to fall into the hands of the *peishwas* or prime ministers. The title of the successors of Sevaji was *maharajah*, or great prince. The vigour of the government still continued under the peishwas. The dominion of the Mahrattas was extended over Gujerat, Berar, Orissa, Malwa, and the Deccan, and they levied tribute in every part of India. The Mogul emperors, unable to control their numerous insubordinate vassals, repeatedly called in their aid, which was always dearly paid. After Baji Rao, who became peishwa in 1720 on the death of his father, the peishwas became hereditary heads of the empire. The authority of the peishwas at length also declined, and the various chiefs of the Mahratta states came to form a confederacy, the members of which were often at war among themselves, as well as with their neighbours. The various occasions on which the Mahrattas appeared among the leading actors in Indian affairs have already been noticed in our history of India. (See INDIA—History.) The religion of the Mahrattas was Brahmanical.

MAI, ANGELO, CARDINAL, librarian of the Vatican, an eminent classical scholar, was born of humble parentage at the village of Schilpario, in the territory of Milan, on 7th March, 1782. His uncommon abilities, as displayed at the village school, attracted the notice of Father Mozzi, a Jesuit, who instructed him in Latin, Greek, and mathematics. On the establishment of a Jesuit college at Colorno, in the duchy of Parma, he accompanied Father Mozzi thither in 1799, and a few years afterwards was made professor of Latin and Greek in the Jesuit college at Naples. He was afterwards transferred successively to Rome and Orvieto, and ultimately to Milan (1808), where he became an associate of the Ambrosian College, and one of the curators of the Ambrosian Library. Here he found full scope for gratifying his antiquarian curiosity and turning to account his classical learning; and he accordingly commenced a careful investigation of the manuscripts in its repositories. One special department to which he devoted himself was the examination of the Palimpsests (see PALIMPSESTS) or re-written manuscripts, and through his industry in deciphering these, two volumes of fragments of Cicero's orations, some orations of Lysimachus and Isæus, a fragment of the Vidularia (a lost comedy of Plautus), and a collection of the letters and other writings of Cornelius Fronto, the preceptor of Marcus Aurelius, were recovered and given to the world. In 1819 he was appointed chief keeper of the Vatican Library at Rome, and shortly after his installation in that office had the good fortune to discover beneath a manuscript of St. Augustine's Enarrationes in Psalmo obliterated fragments of Cicero's treatise De Republicâ, amounting to about a fourth of the original, which he published in 1822 with an admirable critical commentary, interweaving in addition with the text such portions of the work as could be gleaned from the quotations scattered through various ancient writers. A colossal work was next undertaken by Mai, the editing of the various unpublished manuscripts in the Vatican, sacred and profane. It comprises ten quarto volumes, under the title of Scriptorum Veterum Nova Collectio e Vaticanis Codicibus edita (1828–38), and consists of numerous fragments, previously believed to be lost, of the ancient historians, such as Polybius, Diodorus Siculus, Dionysius of Halicarnassus, Dion Cassius, Appian, and others, besides the various writings of the fathers. In 1833 Mai was transferred from his office in the Vatican, in which he was succeeded by the celebrated linguist Mezzofanti, to the secretaryship of the Propaganda, but he still continued assiduously his literary labours. Classici Scriptores ex Codicis Vaticanis editi appeared in 1838. In 1838 he was created a cardinal. A new

collection, designated Spicilegium Romanum, was published in ten volumes between 1839 and 1844, and a patristic series, called Nova Patrum Bibliotheca, issued between 1845 and 1853, closed his list of classic publications. He had also projected an edition of the celebrated Codex Vaticanus of the Scriptures, with critical dissertations prefixed; but though he proceeded so far as to have the original text printed at the Propaganda press, the writing of his introduction to the work was delayed from year to year, and death supervened without any progress having been made, or the undertaking even fairly commenced. He died at Albano on 8th September, 1854.

MAIA, in Greek mythology, the eldest daughter of Atlas and Pleione, the mother of Hermes by an amour with Zeus in a grotto of the mountain Cyllene in Arcadia. She was placed with her six sisters among the stars, where they have the common name of *Pleiades*. The Romans also worshipped a Maia, who was also called *Majesta*, and was afterwards identified with the daughter of Atlas. The Tusculans called their principal deity *Majus*, so that here the two highest deities or principles of nature appear in a male and female form. The month of May is said to have received its name from them.

MAIDEN is the name of an instrument of capital punishment used in Scotland during the sixteenth and seventeenth centuries, and which is the prototype of the French guillotine. The maiden was a broad piece of iron a foot square, sharp on the lower part, and loaded above with lead. At the time of execution it was pulled up to the top of a frame 10 feet high, with a groove on each side for the maiden to slide in. The prisoner's neck being fastened to a bar underneath on a sign given the maiden was let loose, and the head instantly severed from the body. It is said to have been brought by the regent Morton, who was eventually one of its earliest victims, from Halifax, in Yorkshire, to Scotland.

MAIDENHEAD, a municipal borough and market town, England, in the county of Berks, 12 miles E.N.E. from Reading, near the right bank of the Thames, here crossed by a fine stone bridge, and on the Great Western Railway. It consists principally of one long street, in which the houses are tolerably well built; and has churches and chapels for various denominations, a town-hall and market-house, national, British, and other schools, several endowed charities; trade chiefly in malt, corn, meal, and timber. Pop. in 1881, 8220.

MAID OF ORLEANS. See JEANNE D'ARC.

MAIDSTONE, a municipal and parliamentary borough and market town of England, in the county of Kent, in a pleasant and fertile valley, 32 miles S.S.E. from London, on the banks of the Medway, here crossed by a handsome bridge of three arches, completed in 1879. The town consists chiefly of four principal streets, which cross each other at the market-place, with smaller ones branching off at right angles. It has a neat town-hall, and an extensive county jail; a fine old church, one of the largest parochial buildings in the kingdom, supposed to be of the fourteenth century; a free grammar-school, and several charity schools; and an excellent hospital, and many alms-houses. The only manufactures worth mentioning are paper (for which there are several large mills) and brewing. An extensive trade is carried on in fruit and hops. It is connected with both the South-Eastern and the London, Chatham, and Dover Railways. The Medway is navigable for fifteen miles above the town. The borough sends two members to Parliament. Pop. parl. bor. (1881), 29,647; mun. bor., 29,623.

MAIL, COAT OF. See COAT OF MAIL, CHAIN-MAIL, and HABERGEON.

MAIL COACHES. See COACH.

MAIMONIDES, properly *Moses Ben Maimon Ben Joseph*, and in Arabic, *Abu-Amram-Musa-ibn-Abdal-lah*, of a distinguished Jewish family, was born at Cordova about 1131, 1135, or 1139, and after studying Jewish and Arabic literature and Greek philosophy, the last in an Arabic translation of Aristotle, attended the lectures of the Arabic philosophers, and made himself acquainted with the healing art. Driven from his studies by the persecutions of the Almohades against the Jews in Andalusia in 1148, and obliged to conceal his belief in Judaism, he ultimately removed with his father about 1160 to Fez, afterwards travelled to Jerusalem, where he was in 1165, and soon after fixed his residence in Fostat, opposite to Cairo. Here he married, lived at first by dealing in precious stones, and then became physician to the Sultan of Egypt, and superintendent of the Jewish communions. His skill as a physician and a philosopher, his learning, his excellent character and brilliant talents, and above all his writings spread his fame over the East and West, among Arabs and Jews. After his death in 1204 his body was carried to Palestine. Many of his writings were translated during his lifetime; and both as a theologian and expounder of the law he exercised an extraordinary influence on the whole development of Judaism. The new courses which he followed became an arena for literature and orthodoxy, and in the thirteenth century his books were widely circulated in Europe by means of Latin translations. His best writings in Arabic are the More Nebochim, or Guide of the Erring; a Compendium of Logic; a Commentary on the Mishna; an Exposition of the 613 Laws of Moses, &c. He wrote in pure Hebrew the Mishne Thora, afterwards usually called Jad Chasaka, or The Work, containing a complete system, in 982 chapters, of the Talmudic Judaism. He also translated Avicenna's Canon into Hebrew. He died about 1201-9.

MAIN, or MAYN, a river of Germany, which is formed in the north of Bavaria by the junction of the White and the Red Main about 13 miles north-west of Baireuth. It flows north-west to the confines of Bavaria, and then makes a succession of remarkable zigzags, continuing however in a westerly direction, till it reaches the confines of Hesse-Darmstadt, which it enters. It then flows circuitously west, partly forming the boundary between Hesse-Darmstadt and the Prussian province of Hesse-Nassau, and joins the right bank of the Rhine a little above the town of Mainz after a course of 230 miles. Its principal affluents are—on the right, the Rodach, Itz, Raunach, Franconian Saale, Kinzig, and Nidda; and on the left the Regnitz, Tauber, and Gersprenz. The principal towns which it passes are Würzburg, Aschaffenburg, and Frankfurt. It is navigable for about 200 miles, commencing at the confluence of the Regnitz; and by means of King Ludwig's canal, it affords through navigation to the Danube.

MAINE, one of the eastern and maritime United States of North America, bounded on the east and north-east by New Brunswick, north and north-west by Lower Canada, west by the state of New Hampshire, and south-east by the Atlantic Ocean; area, 33,040 square miles. It is an elevated country, but hilly rather than mountainous. From the west side of the state, east of the White Mountains in New Hampshire, an irregular chain of highlands extends east to the north of the sources of the Kennebec and Penobscot, and passing south of the sources of the Aroostook, terminates on the eastern boundary of the United States. Katahdin Mountain, about 70 miles north of Bangor, between the east and west branches of the Penobscot, the most elevated summit of the chain, is 5385 feet high. Another chain of highlands

extends in a north-westerly direction from near the north-western source of the Connecticut, dividing the waters which flow north into the St. Lawrence from those which flow south into the Atlantic Ocean and the Bay of Fundy, probably nowhere less than 1400 feet high. The state is almost completely traversed by navigable rivers, the principal of which are the Penobscot and Kennebec; and in the interior are numerous lakes, of which Moosehead is 35 miles long by 10 to 15 miles broad, and Umbagog, partly in New Hampshire, is 18 miles long and 10 miles broad. The number of the smaller lakes is so great that one-tenth of the surface of the state is computed to be covered with water. The coast abounds with islands, the largest of which is Mount Desert, 15 miles long and 12 miles broad; and is indented with numerous bays and inlets, the principal of which are Penobscot, Casco, and Passamaquoddy. The shores are bold and rocky, but the bays and inlets afford abundance of excellent harbours. Though between the Kennebec and Penobscot there is some excellent land, the soil of the state as a whole is not fertile. Grass lands are extensive, and Indian-corn, wheat, barley, rye, and flax are the chief crops. The uncleared lands are of great extent, and furnish pine and other timber, which in the form of masts, planks, boards, &c., is exported in large quantities. Lime and a light-coloured granite for building, with fish, potash, beef, pork, &c., are also largely exported. The fisheries give employment to a large portion of the population. Woollen and cotton fabrics are largely made; and flour, saw, and other mills, tanneries, and other leather manufactories, foundries, &c., are numerous. Shipbuilding is carried on to a great extent. The railways are over 1000 miles in length. Maine became an independent state in 1820, having previously belonged to Massachusetts. It is divided into sixteen counties. Augusta, on the Kennebec, is the seat of government, but Portland is the principal town, and a seaport of great importance. Maine has an excellent system of public schools, and possesses the well-known and long-established Bowdoin College. The governor, senate, and house of representatives are elected annually by the people. Seven councillors are elected by the legislature to advise the governor in his executive duties. The senate consists of 31 members, the house of representatives of 151. The judges of the supreme court are appointed by the governor and council for a term of seven years. Pop. in 1860, 628,279; in 1870, 626,915; in 1880, 648,936.

MAINE, an ancient province of France, which, united with Perche, formed one of the thirty-two great governments of the kingdom. It was bounded on the north by Normandy, on the east by Perche, on the south by Anjou, and on the west by Brittany. Its capital was Mans. It now forms the greater part of the department of Sarthe, the department of Mayenne, and parts of the departments of Orne and Eure-et-Loir. It was part of the French dominions of Henry II. of England, and was conquered by Philip Augustus.

MAINE DE BIRAN (*Marie-François-Pierre Gonthier de Biran*), a French philosopher, was born at Bergerac in 1766. At first he tried a military career, and entered the *garde du corps* in 1785. He was wounded fighting in the ranks in October, 1789, after which he retired into private life, and sought by study to shut out reflection on the terrible events which were happening around him. In 1795 he accepted the administration of the department of the Dordogne, and in 1797 his constituents sent him as a member to the Council of the Five Hundred. He opposed the Directory, who annulled his election after the coup d'état of 18th Fructidor (4th September), 1797. An essay, Influence de l'Habitude, which he wrote for a competition in the Institute, was crowned in 1802, and published in the following year. Another essay, Sur la Décomposition de la Pensée, was crowned in 1805. A third, Sur l'Aperception immédiate, was crowned by the Academy of Berlin in 1807, and a fourth by the Academy of Copenhagen, entitled Rapports du physique et du moral. The last is considered one of his best pieces. In 1806 he was named sous-préfet of Bergerac. Here he founded a literary society, for which he wrote an essay on Somnambulism, &c. The same year he was elected deputy for Bergerac. He opposed Napoleon and favoured the invasion of the allies. On the restoration of the Bourbons he took his place again in the *garde du corps*. In 1816 the king nominated him as councillor of state. He died at Paris in 1824. Maine de Biran's importance as a philosopher is chiefly due to his giving the direction to philosophic speculation afterwards developed in the school founded by Victor Cousin. Cousin called him the greatest metaphysician France had produced since Malebranche, and Royer Collard said, 'He is the master of us all.' He began as a disciple of the school of Locke and Condillac, but by his own meditations rather than by the study of the writings of others he gradually separated himself completely from it. His final conclusion was that man acquires the consciousness of himself neither by physical observation nor by abstract reasoning but directly by self-perception; that the *ego* is not an abstraction nor an assemblage of sensations but a simple, primitive fact, distinct from sensation, of which it judges and makes use. The *ego* manifests itself by desire, which has its correlative in organic resistance. No force or cause, he says, can represent itself under a material image. Every efficient cause, even in physical movements, is an immaterial force. The vindication of the independent activity of mind is his special philosophic characteristic. Besides the works mentioned he wrote Examen des leçons de Philosophie de Laromiguière, &c. Cousin has collected his works. (See COUSIN, VICTOR.)

MAINE-ET-LOIRE, a western department of France, bounded north by the department of Mayenne, north-east by Sarthe, east by Indre-et-Loire, south-east by Vienne, south by Deux-Sevres and Vendée, west by Loire-Inférieure; area, 2750 square miles. It has a gently-undulating surface, the slopes of which are generally covered with vines, while the plains are of great fertility. It is remarkably well watered, particularly by the Loire, which traverses it almost centrally, east to west, and receives within the department the united streams of the Loir, Sarthe, and Mayenne. The only metal is iron; but the slate-quarries are extensively worked. Of the surface 1745 square miles are arable, and 333 consist of meadow land. The principal crops—rye, barley, and oats—after supplying the home consumption, leave a considerable surplus for exportation. Hemp and flax of excellent quality are extensively grown, and some of the white wines produced bear a good name. The principal fruits are apples, from which fine cider is made, and prunes. Nuts also form an important article of produce. The breed of horses is good, and great numbers of cattle are grazed and fattened for the capital. The forests, which cover above one-twentieth of the surface, abound both in large and small game; the rivers are well supplied with fish. The manufacture of cotton, linen and woollen tissues is the most important industry after agriculture. The trade is chiefly in corn, clover seed, wine, brandy, cattle, slates, leather, iron, &c. This department originally formed part of the Roman province of *Lugdunensis Tertia*. For administrative purposes Maine-et-Loire is divided into the five arrondissements of Angers (the capital), Baugé, Beau-

préau, Saumur, Segré; subdivided into thirty-four cantons and 381 communes. Pop. (1881), 523,491.

MAINOTES, the inhabitants of the mountainous district of the Morea called *Maina*, in the Grecian province of Laconia. They have been supposed to be the descendants of the ancient Spartans, but probably are composed of fugitives from all parts of Greece, who found safety in this remote corner, protected by the rocks and the sea. They are Christians of the Greek church, and never submitted to the Turkish yoke. They are hardy, brave, and skilful in the use of arms, and with the barbarous practice of robbery unite the virtue of hospitality. They were among the first to distinguish themselves in the Greek revolution.

MAINTENANCE, an unlawful intermeddling in a suit, by assisting either party with money, or otherwise to prosecute or defend it. This was prohibited by the Roman as well as by the English law. A man may, however, maintain the suit of his near kinsman, servant, or poor neighbour with impunity. See BARRATRY, COMMON.

MAINTENANCE, CAP OF. See CAP.

MAINTENON, FRANÇOISE D'AUBIGNÉ, MARCHIONESS OF, descended of a noble Protestant family, was born in 1635 in the prison of Niort, where her father was confined. In 1639, M. d'Aubigné, having been released, set sail for Martinique with his daughter. After his death in 1645 his widow returned to France totally destitute, and the young Frances was taken into the house of her aunt, a Calvinist, whose creed she soon after adopted. Every means was used by her mother to reclaim her, and she finally yielded to harsh treatment, and after a long resistance abjured that creed. The death of her mother left her solitary and dependent, and although she was received into the house of Madame de Neuillant, her godmother, she was subjected to all kinds of humiliations, and considered herself happy in becoming the wife of the deformed, infirm, and impotent Scarron, who, touched with her situation, offered to pay the sum necessary to enable her to enter a convent, or to marry her. Scarron was not rich, but his family was respectable, and his house was frequented by the most distinguished society of the court and the city. His wife conciliated general respect, esteem, and affection by her social qualities, her talents, and her modesty. On his death in 1660 his widow, who was again left destitute, was on the point of embarking for Portugal as a governess, when Madame de Montespan, the mistress of Louis XIV., procured her a pension, and afterwards had her appointed governess to the Duke of Maine and the Count of Toulouse, her sons by Louis. In this post she became better known to the king, who was at first prejudiced against her, but who learned to esteem her for her good sense and the care which she bestowed on the education of the Duke of Maine. He made her a present of 100,000 livres, with which, in 1679, she purchased the estate of Maintenon, and becoming fond of her society, gradually passed from intimacy to love. Madame de Montespan had alienated the king by her arrogant temper, and having acquired a leaning to devotion he had scruples about his connection with her as a married woman. All this confirmed his inclination for Madame de Maintenon, whose yielding temper and eagerness to study his wishes had made her society indispensable to him. Père Lachaise, his father confessor, advised him to secure his wishes by a secret but formal marriage, which was solemnized by the Archbishop of Paris in 1685. After her elevation she lived in a sort of retirement from the world. Louis XIV. visited her several times a day, and transacted business with his ministers in her apartments, while she read or otherwise employed herself. Although in appearance she neither knew nor wished to know anything of state affairs, yet she often had a decisive influence on them. Chamillart was made minister, and Marsin commander of the army in Germany (1703), and Vendôme and Catinat were dismissed by her influence. The perpetual slavery of being forced to do all she could to render herself agreeable to the king made her more unhappy than the poverty of her youth. 'What a martyrdom,' said she to Lady Bolingbroke, her niece, 'to be obliged to amuse a man who is incapable of being amused.' She did nothing for her family, because she feared to attract the notice of the nation she would receive nothing herself but the estate of Maintenon, and a pension of 48,000 livres. Among her benevolent plans was the foundation of the school at St. Cyr, for the education of poor girls of good family. Thither she retired after the death of the king in 1715, taking part in the instruction and amusements of the pupils, till her own death, in 1719. The letters of Madame Maintenon were published in 1752, two vols. 12mo, and in 1756, in nine vols 12mo, by La Beaumelle, who also published Mémoires de Madame Maintenon (Amsterdam, six vols 12mo). This work is vehemently attacked for its misrepresentations by Voltaire, and is generally regarded as apocryphal, although the author appears to have had access to important sources of information. The letters have reference chiefly to education. A more accurate edition of them has been given by Th. Lavallée, under the title Lettres historiques et édifiantes (1856, two vols. 12mo). They are esteemed for their good sense and judgment, as well as for their anecdotes.

MAINZ (ancient, *Moguntiacum*; English, *Mentz*; French, *Mayence*), a town of Germany, Hesse-Darmstadt, capital of the province of Rheinhessen, on the left bank of the Rhine, opposite to the mouth of the Main, and 20 miles W.S.W. Frankfort, with which it is connected by railway. It is a fortress of the first rank of the German Empire. The town, situated partly on a flat and partly on an acclivity, rises up gradually from the Rhine in the form of an amphitheatre. It is walled, flanked with bastions, and defended besides by a citadel and outlying forts. There is a railway bridge spanning the Rhine a little above the junction of the Rhine and Main, and a bridge of boats connects Mainz with its suburb of Kastel, on the opposite side of the Rhine. The houses are generally lofty, and, when situated in open squares and spacious streets, have often a venerable and noble appearance; but many of the streets in the older parts are narrow and crooked. The oldest portion was almost entirely destroyed by the explosion of a powder magazine in 1857. The great open-air resort of the inhabitants is the Neue Anlage, outside the gates, consisting of extensive public gardens and commanding fine views of the town and surrounding district. The principal edifices are the cathedral (now undergoing extensive restoration), a vast building of red sandstone, finished in the eleventh century, adorned with several finely painted windows, a beautiful pulpit, and a great number of ancient and curious monuments of the Bishop Electors of Mainz; the ravchants' hall, formerly the electoral palace; the old collegiate church of St. Stephen, occupying the highest site in the town, surmounted by a lofty tower, decorated within by a fine altar screen, and presenting throughout one of the finest specimens of early Gothic architecture; the church of St. Peter; the German House, or grand-ducal castle, now the governor's palace, containing a splendid hall, decorated with statues and several portraits of electors and Teutonic grand-masters; the former Palace

Palace, now used by the courts of justice; the library buildings, containing, in addition to the library, a museum, with several good collections, antiquities, philosophical and chirurgical apparatus, pictures, &c. One of the most interesting objects in the town is the house, or rather the site of the house of Gutenberg (see GUTENBERG, JOHANNES), and the house which contained his first printing-office. An admirable bronze statue of Gutenberg by Thorwaldsen, erected by subscriptions obtained from all parts of Europe, stands in an open space near the theatre. The manufactures consist chiefly of leather, furniture, hardware, carriages, carpets, tobacco, beer, chemicals, and musical instruments. The trade, particularly transit, is extensive, being greatly facilitated both by water communication and railway, and has in recent times greatly increased. The principal articles are Rhenish wine, corn, flour, oil, coal, and wood. Mainz owes its foundation to a Roman camp which Drusus pitched here. It shortly after became the most important of a line of forts built along the Rhine, as a barrier against the incursions of the Germans. On the decline of the power of Rome it was almost entirely destroyed, but was afterwards restored, chiefly by Charlemagne, and became the first ecclesiastical city of the German Empire, of which its archbishop-elector ranked as the premier prince; he possessed extensive domains, with a population of 400,000. Its history during the sixteenth century is of considerable interest in connection with the progress of the Reformation, which early brought Luther into collision with its ecclesiastical authorities. Pop. (1880), 61,328.

MAIOLICA. See FAIENCE.

MAIRE, LE, STRAITS OF, a narrow channel or passage from the Atlantic to the Pacific Ocean, between Terra del Fuego and Staten Land. It derives its name from Le Maire, a Dutch pilot, who discovered it in 1616.

MAISTRE, JOSEPH MARIE, COMTE DE, Sardinian minister, and member of the Royal Academy of Sciences at Turin, born at Chambery, in 1754, of a French family, was a senator of Piedmont at the time of the French invasion (1792). He left his country in consequence of that event, and afterwards followed his king to Sardinia. In 1804 he was sent ambassador to St. Petersburg, returned to Turin in 1817, and died there in 1821. De Maistre was familiar both with Greek and Latin literature, and was an admirable master of the French language, his writings in which have obtained the highest praise of critics. He was a reactionary in politics, religion, and philosophy, a supporter of absolute monarchy, and of the infallibility of the pope. His Mémoires politiques et Correspondance diplomatique (Paris, 1858), however, shows him in the light of a much more discerning and less uncompromising politician than his formal treatises, and indicates a large and liberal appreciation of the revolution which he opposed. As a diplomatist he exerted himself to effect the restoration of all his former possessions to his master, and to obtain the transfer of Genoa. Among his political writings are his Éloge de Victor Amadée III.; Considérations sur la France (1796, 3d edition, 1814, and also three editions at Paris); Essai sur le Principe Générateur des Constitutions politiques (1810), in which he maintains the divine origin of sovereignty; Soirées de St. Petersbourg; Du Pape (1819); De l'Église gallicane; and Du Congrès de Rastadt, the last in conjunction with the Abbé de Pradt.

MAITLAND, the second town in New South Wales, 95 miles north of Sydney, in Cumberland County, and on the Hunter River. It contains the two divisions of East and West Maitland, which are separate municipalities. The latter is much the larger. The town has been frequently devastated by the flooding of the river, which also gives fertility to the surrounding soil—a fertility that has earned for the district the title of the granary of New South Wales. The most important crops are maize, wheat, barley, potatoes, oats, lucerne, and tobacco. The grape is also cultivated, with an annual produce of 100,000 gallons of wine. There is abundance of coal of excellent quality in the neighbourhood. The Great Northern Railway connects the town with the port of Newcastle and several inland towns. The principal buildings of East Maitland are the court-house, jail, school of arts, and the branch banks of New South Wales and Australasia. Pop. about 2000. West Maitland is on a low situation, exposing it to inundation. It consists chiefly of the High Street, a long, straggling thoroughfare, intersected by cross streets. It has several handsome banking buildings, a court-house, school of arts, Olympic Theatre, and numerous churches. The population of West Maitland in 1881 was 5300.

MAITLAND, JOHN. See LAUDERDALE.

MAITLAND, SIR RICHARD (Lord Lethington), poet, lawyer, and statesman, son of William Maitland of Lethington, was born in 1496, and after receiving the usual course of education at the University of St. Andrews, was sent to France to study law. On his return to Scotland he was employed in public business by James V., the Regent Arran, and Mary of Guise. In March, 1551, he took his seat on the bench as an extraordinary lord of session. In 1560 he became blind. In 1561 he was appointed an ordinary lord of session, and assumed the title of Lord Lethington. He was soon after sworn a privy-councillor, and from 1562–67 he held the office of lord privy-seal. He was altogether more than seventy years in the public service, and died 20th March, 1586, at the age of ninety. He collected the decisions of the Court of Session from September, 1550, to July, 1565. The manuscript is in the Advocates' Library. His more celebrated collections of early Scottish poetry in one folio and one quarto volume are in the Pepysian Library at Magdalene College, Cambridge. The Maitland Club, named after him, published a volume (4to) of his own poems in 1830. They also printed in 1829 his Chronicle and History of the House and Sirname of Seaton.

MAITLAND, WILLIAM, commonly known as Secretary Lethington, a Scottish statesman, eldest son of Sir Richard Maitland, born about 1525. He was educated at St. Andrews, travelled and studied civil law on the Continent. He adopted the career of politics in his youth, and became early renowned for subtlety, enterprise, and spirit. In 1555 he attended the preaching of Knox, and had some private conference with him. He consequently adopted the reformed doctrines, and was one of the first public men openly to renounce the mass. In 1558 he was appointed secretary of state by Mary of Guise. In the following year he joined the lords of the congregation who had taken possession of Edinburgh. The lords despatched him to England to lay their position before the queen, who sent a fleet to the Firth of Forth. He was also appointed one of the commissioners to meet with Queen Elizabeth's commissioners at Berwick to arrange the terms of intervention. Here the Treaty of Berwick was concluded, which provided for the advance of the English troops into Scotland. In 1560 he was speaker of the Parliament which abolished the authority of the Pope in Scotland. On Queen Mary's arrival in Scotland he was chosen one of her principal ministers, although he is suspected of having given information to Elizabeth to cause her arrest on the passage. In 1561 he was made an extraordinary lord of session. He opposed the ratl-

fication of Knox's Book of Discipline by the queen, which was accordingly refused. He was sent on an embassy of courtesy to announce Mary's return to Queen Elizabeth, and on his return accompanied her in her expedition to the north in 1562 against Huntly and the Gordons. He was afterwards again sent on an embassy to England, and at this period he was blamed by the nobility for serving the queen to the prejudice of the commonwealth. In 1563 he conducted with great zeal and acrimony a prosecution against Knox for intriguing with the Protestant leaders. In June, 1564, he had a keen debate with Knox in the General Assembly on obedience to the queen and on the form of prayer to be used for her. In 1565 he was appointed an ordinary lord of session. In April he was despatched to intimate to Elizabeth Queen Mary's proposed marriage with Darnley. In 1566 he was deprived of office for participation in Rizzio's murder, but restored before the end of the year. He was also an accomplice in the murder of Darnley and the enterprise of Bothwell, and he joined the confederacy of the nobles for the removal of Bothwell. On the queen's imprisonment at Lochleven he offered his services and assisted in contriving her escape, yet he attended the coronation of James VI. and fought against her at Langside. In 1568 he accompanied Moray as one of the commissioners at the York conferences. Here he is said to have intrigued with Mary's commissioners and informed them of the regent's proceedings. He is also said to have contrived the scheme of Mary's marriage with Norfolk, which probably through his influence was countenanced by Moray. Moray sent him as one of two commissioners to Queen Elizabeth, the other commissioner being sent to watch him. On his return he joined the queen's faction and retired to Perth. The regent suspecting him of being at the bottom of all the intrigues in favour of Mary both in England and Scotland had him arrested in September, 1569, as an accessory to Darnley's murder. He was set at liberty by Kirkcaldy of Grange, who offered to produce him at the trial if there was any accuser, but none appeared. After the assassination of Moray he obtained from the lords assembled to consult on the affairs of the country a declaration acquitting him of all the charges against him. From this time he became the life and soul of the queen's party, and kept up an active correspondence with Mary. He was deprived of the office of secretary by the Regent Lennox, who sent troops to ravage his lands and those of his father. In April, 1571, he joined Kirkcaldy in Edinburgh Castle. In May he was proclaimed a traitor by the Parliament and attainted with his two brothers. He instigated Kirkcaldy to hold out the castle to the last, and a memorable controversy occurred between him and Knox, then on his death-bed. He complained that Knox had accused him of atheism, which charge he denied. Knox replied that the charge was founded not on his words but his actions, and added that God had assured him that there was mercy for Kirkcaldy, but as for Maitland he had no warrant to hope well of him. The castle surrendered to Elizabeth's commander on 29th May, 1573. Kirkcaldy and his brother were hanged, but Maitland died in prison in Leith on 9th June, 1573.

MAIZE, or INDIAN-CORN (*Zea mays*). The native country of this valuable grain remains still undetermined. It is usually attributed to America, where it was cultivated by the aborigines at the time of the discovery; but no botanist has hitherto found it growing wild in any part of the new continent. Its culture did not attract notice in Europe, Asia, or the north of Africa till after the voyage of Columbus. It was unknown to the ancient Greek and Roman writers, and is not mentioned by the earlier travellers who visited China, India, and other parts of Asia and Africa, and who were very minute in describing the productions of the countries which they visited. Notwithstanding these considerations some authors have endeavoured to prove that it was originally from India, and thence introduced through Persia to Africa. Others again have attributed its origin to the western coast of Africa.

It belongs to the order of the Grasses (which see), and is shown in our Plate XC.-XCI. fig. 7. It is annual and herbaceous. The root is fibrous; the stems rise to the height of from 4 to 10 feet, and, like other grasses, are furnished with knots at intervals. The leaves are alternate, sessile, sheathing at the base, and are slightly pubescent on their superior surfaces, and ciliate on the margin; they vary in length from 1 to 3 feet by 3 or 4 inches in breadth. The male flowers are disposed on several spikes, which together form a large panicle at the summit of the stem. The female flowers are very numerous, sessile, and disposed in the axillæ of the superior leaves upon a common axis, which is surrounded with foliaceous sheaths or husks; the styles are very numerous, 6 to 8 inches long, and hang down like a silken tassel from the extremity of the foliaceous envelope; the seeds or grains are rounded externally, angular and compressed at the sides, and tapering towards the base, and are disposed in several longitudinal series. A great number of varieties are cultivated, differing in the size, hardness, number, and colour of the grains, the form of the spikes or ears, and, what is a very important circumstance to the human family, in the time required to bring them to maturity. The grains in some varieties are violet or black; in others purple, white, or variegated; and sometimes grains of different colours are found on the same spike; but the usual colour is golden yellow. Some varieties require five months from the time of sprouting for the perfect maturity of the grain, while the period of six weeks is sufficient for others. Owing to this circumstance this plant can be cultivated in a far wider range of climate than any other species of grain.

Maize is now very extensively cultivated, not only in America, but throughout a great part of Asia and Africa, and also in several countries of the south of Europe, as in Spain and Italy. In many of the provinces of France it forms almost exclusively the sustenance of the inhabitants. In some parts of America two crops are obtained in a season, but as it is found to exhaust the soil very soon it is usually planted upon the same piece of ground only after an interval of five or six years. It succeeds best in a light and slightly humid soil. The usual, though not the best mode of planting, is in little hillocks raised at intervals throughout the field, to each of which is allotted five or six grains. These last, after being dipped in water, will often sprout after a lapse of five or six days; the young plants are liable to be injured by frost. In many countries, after flowering, the tops are cut and used for fodder for cattle, and a portion of the leaves stripped also; but this last operation should be delayed till near the time of maturity, which is indicated by the drying of the leaves and the hardness and colour of the grains. The spikes or ears are gathered by hand, and the husks, when perfectly dry, stripped off, and, together with the stalks, laid by for winter fodder, while the ears are conveyed to the granary. The green stems and leaves abound in nutritious matter for cattle, and in some countries maize is cultivated solely for this purpose, especially after early crops of other vegetables; when planted for this object it should be sowed very thickly. Corn, when well dried, will keep good for several years, and preserve its capability of germina-

tion. It is eaten in various manners in different countries, and forms a wholesome and substantial aliment. Domestic animals of every kind are also extremely fond of it. It is considered as too stimulating for the common food of cattle. Mixed with rye meal it forms the common brown bread of New England; with water alone it makes a palatable species of bread. Ground very coarse and boiled it forms the 'hominy' which is so great a favourite in the southern parts of the United States; and the fine meal boiled thick in water is the 'mush' of Pennsylvania and the 'hasty-pudding' of the Eastern States. In the form of hulled corn or *samp* the whole grains furnish a very palatable, although rather indigestible, luxury. The ashes contain a large proportion of potash. Of the husks a beautiful kind of writing paper has been manufactured in Italy; and when soaked in hot water they make excellent mattresses; a grayish paper may be made from all parts of the plant. A variety has been obtained in Paraguay in which each grain is surrounded by glumes, and this, according to the report of the Indians, grows wild in the woods.

MAJESTY (Latin, *majestas*). *Majestas*, in a collective sense, was used in republican Rome to signify the highest power and dignity, the attribute of the whole community of citizens, the *populus*. The *majestas* was also ascribed to the dictator, consul, and even senate, though in the case of the last the word *auctoritas* was used in preference. The *majestas* was ascribed to persons or bodies of persons, so far as they had legislative power, the right to declare war and peace, decide on political offences, and elect magistrates. He who violated this *majestas* (for instance, betrayed an army, caused sedition, or infringed the existing institutions or the rights of the people) made himself guilty of the *crimen majestatis* or high treason. When the republic was overthrown the *majestas* of the people or state passed over to the Roman monarchs, and from them again to the emperors of Western Europe. At a later period, under the Roman emperors, *majestas* was the name of the imperial dignity, whilst that of a magistrate was called *dignitas*. To kings the attribute of majesty was given much later. The courtiers introduced the title in France under Henry II.; yet as late as during the negotiations respecting the Peace of Westphalia we find disputes respecting this title. In the Treaty of Cambray (1529) the title of *majesty* is given to the Emperor Charles V. only. In the Treaty of Crespy (1544) Charles V. is styled *imperial*, Francis I. *royal majesty;* and in the Peace of Câteau-Cambrésis (1559) the titles of *most Christian and Catholic majesty* are found for the first time. In England Henry VIII. first adopted the title *majesty*. At present this title is given to all European emperors and kings. To this title the obsequiousness of former ages and the conception of a religious character attached to earthly rulers added epithets intended to elevate it still higher, as 'most gracious' in England, 'most highest' (*Allerhöchste*) in Germany. Before the word *majesty*, if used of the emperors of Austria and Germany, the letters *K.K.* are put, which stand for *Kaiserlich-Königliche* (*Majestat*—imperial-royal majesty). The pope has given the epithet of *majesty*, with additions, to several monarchs, as *Catholic majesty* to the King of Spain, *apostolic majesty* to the King of Hungary, *most Christian majesty* to the Kings of France, *most faithful majesty* to the sovereigns of Portugal.

The name of *Majestäts-brief*, or *charter of majesty*, was given to the act by which the Emperor Rodolph II. granted (June 11, 1609) free exercise of their religion to the adherents of the Augsburg Confession in Bohemia. The Emperor Matthias abolished the act in 1618, which was one of the principal causes of the Thirty Years' war.

MAJOLICA, or MAIOLICA. See FAIENCE.

MAJOR, in the army, is a field officer next in rank above a captain and below a lieutenant-colonel. His duties are to superintend the exercises of the regiment or battalion, to carry out the orders of his superior officers, and to command in the absence of the lieutenant-colonel. The regimental rank of major does not exist in the artillery, engineers, or marines. A major-general is next in rank below a lieutenant-general. A brigade-major performs the same duties for a brigade as a regimental major for the regiment; a sergeant-major is a non-commissioned officer who superintends the military exercises of the soldiers, and dresses the line on parade. This designation was formerly borne by the regimental major.

MAJOR, in music, designates in general a larger in contradistinction to a smaller interval of the same denomination, called a minor interval; thus a major-tone is the interval between two tones having the proportion to each other in number of vibrations of 8 : 9, a minor tone the interval between two tones in the ratio of 9:10; a major third is an interval of two tones (major and minor); a minor third an interval of a tone and semitone; a major sixth is an interval of four tones and one semitone; a minor sixth is an interval of three tones and two semitones. The major and minor seventh are in like manner distinguished by an interval of a minor semitone. The fourth and fifth have not major and minor forms; their variations are designated by the epithets *perfect*, *imperfect*, and *superfluous*. The *major mode* is one of the two recognized modern modes (or forms of the scale), in which the first third in the scale is a major third, in contradistinction to the minor mode, in which the first third is a minor third; in other words the key-note of the minor mode is the sixth of the major.

MAJORCA (Spanish, *Mallorca;* Latin, *Balearis Major*), an island in the Mediterranean belonging to Spain, the largest of the Balearic group, between Iviza and Minorca; area, 1420 square miles. It is very irregular in shape, and deeply indented, particularly in the north-east, by the bays of Alcudia and Pollenza, and on the south-west by that of Palma. The coasts on the west and north, facing Spain, are very lofty and steep; in other directions, and particularly on the east, they are low and shelving. A great number of good natural harbours are scattered round the coasts, and more especially in the larger bays. The interior is finely diversified by mountains, hills, valleys, and plains. The culminating point, Puig de Torella, has a height of about 4800 feet. Almost all the rocks consist of limestones belonging to the upper part of the secondary formation, and overlaid by tertiary strata. The climate is temperate, but violent winds are not unfrequent, and the air is often overcharged with moisture, which hangs in clouds or descends in mists. The island is generally fertile, producing besides large crops of cereals, hemp, flax, silk, and saffron. Fruits abound; the pastures are rich, and maintain large numbers of cattle; both ground and winged game are plentiful, and the fisheries on the coasts are valuable. The principal occupations of the inhabitants are agriculture and cattle-rearing, and the chief manufacture is that of boots and shoes. The trade, which is active, is chiefly in boots and shoes, oil, wine, brandy, and fruit. The first railway, crossing the island from Palma, the capital, to Inca, was opened in 1875, and other lines are in course of construction. The inhabitants make good soldiers and sailors, and were anciently celebrated for their skill in the use of the sling. Pop. 224,000. See BALEARES.

MAJORITY, in law, is the period of full age. In Great Britain, as well as in most of European countries and the United States, the age of majority, which gives both sexes the free disposal of themselves and property, is twenty-one years.

MAJOR PREMISE, in logic, is that proposition of a syllogism which contains the predicate of the conclusion. See LOGIC.

MAKO, or MAKOVIA, a market town of Hungary, county of Csanad, on the right bank of the Maros, 22 miles east by south of Szegedin. It is the residence of a bishop, and contains a Roman Catholic, a Greek United, and a Protestant church, a Protestant gymnasium, a court-house and county buildings, and handsome barracks, recently constructed. The district around is very fertile, producing abundance of corn and wine, and rearing great numbers of cattle. In all these, and also in wood, the trade is considerable. The fishing in the Maros, which is very productive, occupies a considerable number of the inhabitants; and there are also numerous mills and a yearly market. Pop. 30,063.

MAKOLOLO, a large and once powerful tribe in South Africa, between lat. 13° and 20° S. Linyanti was their capital, and there Livingstone was very successful in missionary work. The people, enterprising and industrious, spread themselves over the country, and subjected a vast territory, under their King Sebituane; but after his death, and during the rule of his son, the work of disintegration began, and at this son's death in 1864 civil war ensued and the short-lived kingdom was broken up.

MALABAR, a maritime district of British India, in the Presidency of Madras, on the west coast, having on the north Canara, east Mysore, Curg, and Coimbator, south Cochin, and west the Indian Ocean. Area, 5765 square miles. A great portion of this district is comparatively low, intersected by narrow ravines, covered with forests and jungle, and watered by innumerable streams, all of them having very short courses. Part of it consists of small low hills, with steep sides formed into terraces for cultivation. The interjacent valleys are extremely fertile, and support a numerous population. In some places a sandy plain 3 miles wide runs along shore, rising into downs covered with cocoa-nut trees, the cultivation of which is carefully pursued, and yields good returns. The coast is indented with numerous inlets. The climate is, on the whole, healthy. The hot season is from February to May, the wet from May to October, and the cool during the remaining months. The principal vegetable products are black and white pepper, cocoa-nuts, cocoa-nut oil, coir-rope, betel-nuts, teak-wood, sandal-wood, cardamoms, ginger, turmeric, sappan-wood, arrow-root, yams, hemp, and copperas. The chief exports consist of the produce of the cocoa-nut tree, pepper, betel-nuts, and cloth, the produce of the east district. Coarse cloths are manufactured at a few places in the interior, from the cotton, the produce of Malabar; coir-rope, cocoa-nut oil, and arrack, from the cocoa-nut tree; jaggery, and coarse brown sugar. Neither the soil nor the climate of Malabar are suited to the cultivation of cotton. What is grown is small in quantity and inferior in quality. The principal towns are Cananor, Tellicherry, and Calicut. Pop. in Feb. 1881, 2,365,035. The name Malabar is often applied to the whole extent of coast country as far north as Bombay.

MALACCA, a British colony, on the west coast of the Malay Peninsula, on the Strait of Malacca, intersected by the parallel of latitude 2° 30′ N. It extends about 40 miles along the shore of the strait, and about 25 miles inland. Area (with Naning), 875 square miles. The sea-coast is rocky, and the interior in some parts mountainous, with picturesque valleys intervening. The rivers are of small importance. The climate is very healthy, the thermometer in the shade ranging from 72° to 85° throughout the year; seldom exceeding the latter or falling much below the former. The soil is remarkably fertile, and in several places capable of producing excellent nutmegs and cloves. Rice and tapioca are grown in abundance, and large quantities are exported. Agriculture is on the increase, and the forests are being rapidly cleared away. Vegetation is remarkably luxuriant; and coffee, sugar-cane, cotton, indigo, chocolate, pepper, opium, and spices are all successfully cultivated. The spontaneous productions of the soil consist of a great variety of fine fruits, including the mangosteen, which is said to attain its highest perfection here. There is abundance of fine durable timber well adapted for ship and house building. The district contains rich deposits of gold and tin, the latter chiefly in Naning. Malacca is one of the Straits Settlements (which see), and is governed by a lieutenant-governor under the general governor of the settlements. Pop. 93,579, of whom 67,513 are Malays, and 19,741 Chinese.

MALACCA, a town of the Malay Peninsula, capital of the above district, at the head of a small bay, on both sides, but mostly on the right, of the Malacca River, near its mouth. It is built in the old-fashioned Dutch style, each house with its out-offices forming a square, with a yard in the centre. Many of the houses are of stone and well built, and several of the streets are spacious and handsome; but the place is poverty-stricken, and with little or no trade. The European population is composed almost entirely of the civil servants of the government and the military men, who reside principally in the vicinity. The principal edifices are the town-house, jail, courthouse, barracks, and civil and military hospitals. There is here an Anglo-Chinese college, founded in 1818 by Dr. Morrison. Malacca has still some export trade in gold-dust, tin, iron implements, fire-arms, nails, ebony, ivory, rattans, lac, aloe-wood, hides, hogs, fowls, jaggery, pepper, &c. Malacca is said to have been founded in 1252 by a chief from Singapore. It subsequently fell into the possession of the Portuguese and Dutch alternately, but was finally exchanged with us by the latter in 1825 for some settlements on the coast of Sumatra. The inhabitants are composed of Malays, Hindus, descendants of Dutch and Portuguese, and Chinese; almost all the artisans being of the last-named nation. Pop. 15,000.

MALACCA, STRAIT OF, the channel between the Malay Peninsula and the Island of Sumatra, extending from latitude 1° to about 6° N. Entire length, about 520 miles; breadth, varying from 25 miles to 200 miles: the former at its south-east extremity, the latter at its north-west. The navigation of the strait appears intricate and dangerous, but with ordinary prudence is not so in reality, the channels being mostly spacious and the anchorage good.

MALACHI, the twelfth and last of the minor prophets. Nothing is known of his history. From the fact that the evils against which he prophesied are the same as those against which Nehemiah had to contend, it is assumed that his prophecy belongs to the latter part of the governorship of Nehemiah, about B.C. 420. The book contains denunciations of the sins of the Israelites, who had begun to neglect the temple worship, to offer defective sacrifices, and to break the precepts of the moral law. The frequency of divorces, and of intermarriages with the heathen, are especially pointed at. It predicts the coming of Messiah and the conversion of the Gentiles.

MALACHITE, a carbonate of copper, of a dark and emerald green colour, and of a laminated, fibrous, or massive structure, occurring in prismatic crystals belonging to the monoclinic series, but more frequently in fibrous, compact, or earthy masses, associated in veins and other strata. Specific gravity = 3·7 to 4·0; hardness = 3·5 to 4·0. The most beautiful specimens are obtained from Chili and Siberia; it also occurs in Shetland, in the Tyrol, in Cornwall and Cumberland, in Africa, and also in North America. Fibrous malachite, when finely pulverized, is used as a paint; massive malachite is made into boxes, knife-handles, table-slabs, and other ornamental articles, and is susceptible of a beautiful polish. In ancient times it was used for stone-engraving, and is still occasionally converted into cameos. It is also one of the materials used in Florentine stone mosaic. The largest piece of malachite known at an earlier period was a block in the Mining Institute at Petersburg weighing about 1½ tons, and obtained from the mines of Verkhoturi; but in 1835 a block was found in Demidoff's mines, near Nishnei Tagilsk in the Ural, 17½ feet long, 8 broad, 3½ thick, and weighing about 25 tons. Veins of malachite are extremely common in the West Ural older floetz formation, which is very widely developed in governments Perm and Orenburg. When cupric salts are treated with alkaline carbonates a precipitate is obtained which, after being some time in contact with the liquid, has the composition of malachite—that is to say, of a hydrated basic carbonate of copper—$CuCO_3 + Cu(OH)_2$.

MALACOPTERI (Greek, *malakos*, soft; *pteron*, a wing or fin), a large sub-order of Teleostean fishes, corresponding to the Physostomata of Müller. The Malacopterous fishes are distinguished by possessing many-jointed, *soft* rays in all the fins, excepting, in some instances, the first rays in the breast or pectoral fins, and in the dorsal or back fins, these particular rays being sometimes hard and spinous. The complete series of fins is generally present, although the ventrals may be wanting. The latter fins if present are always *abdominal* in position, that is, are placed towards the hinder part of the body. There is only a single dorsal fin supported by rays, the other and hinder dorsal fins being soft or adipose fins. The scales are for the most part of the circular or *cycloid* kind, although bony or *ganoid* scales are occasionally present, and in some few cases the skin is entirely destitute of a scaly covering. A swimming or air-bladder is invariably present, this structure opening into the throat or gullet by a *pneumatic duct*, or tube which represents the windpipe of higher animals. The Malacopteri are divisible into two subdivisions; the first of which, the *Apoda*, is distinguished by the absence of ventral fins. The various kinds of Eels represent this first section. The *Abdominalia*, in which the ventral fins are present and placed on the abdomen, comprise very many and familiar fishes, chief among which may be mentioned the herrings (Clupeidæ); the pikes (Esocidæ); the carps, barbels, roaches, &c. (Cyprinidæ); the salmon family (Salmonidæ); the sheat-fishes (Siluridæ), &c.

MALAGA, a seaport town of Spain, Andalusia, capital of a province of the same name. The town is advantageously situated on the north shore of the Mediterranean, near the centre of a semicircular bay, 96 miles south-east of Seville. It is built chiefly along the shore, and is nearly of an oval form. In early times, when occupying much less space than at present, it was surrounded by fortifications. Most of them have disappeared, but considerable portions still remain. The streets are generally long, narrow, and winding, and the houses, though usually of two, three, and even four stories, have an uninteresting, and often even a disagreeable appearance. An exception, however, must be made of a number of modern houses, and also of those lining the public walks, many of which are magnificent. There are several squares in the town. The public edifices are neither numerous nor splendid. Among the most important are the cathedral, a large structure, originally of great architectural merit, but much defaced by incongruous modern alterations, with a principal front adorned by a fine marble colonnade, and flanked by two round towers, and an interior composed of three large naves, and decorated with numerous sculptures and paintings; the episcopal palace; the municipal buildings and court-houses; the new custom-house, the *Consulado* or *Monte Pio*, the old Moorish castle of Gibralfaro; the diocesan seminary, college of San Telmo, and normal school; the theatre, and bull-ring; the foundling, civil, and military hospitals, and various charitable institutions. The manufactures consist chiefly of iron, the ore of which is obtained from rich mines in the vicinity; soap, and leather. The trade is of much more importance, the principal exports being copper and iron minerals, lead in bars, wine, fruit, particularly raisins, oranges, and figs; oil, cork, and silk. The principal imports are coal, codfish, timber, hardware, machinery, and rails. The fine harbour has in recent years been permitted to silt up, so that, notwithstanding some attempts to deepen and extend it, ships drawing over 18 feet are not safe to enter it. The fisheries are productive, and employ a great number of the inhabitants. Malaga is the see of a bishop, the residence of a civil and military governor, and the seat of several important courts and public offices. The foundation of Malaga (anciently *Malaca*) is attributed to the Carthaginians. From them it passed to the Romans, under whom it became a great and flourishing city. It afterwards fell into the hands of the Moors, who possessed it so long and built so much of it, that few cities in Spain present, in their general form and structure, an appearance so decidedly Moorish as that of Malaga. Pop. 94,732.—The province of Malaga lies on the Mediterranean, and has an area of 2822 square miles, and a pop. of 505,010. It is rugged and mountainous, being traversed in all directions by offsets of the Sierra Nevada, the sides of which are clothed for the most part with forests of pine, oak, cork-oak, holly, &c. The valleys are fertile and generally well cultivated, yielding cereals, fruits, the sugar-cane, &c., in abundance. There is a considerable export trade in copper, iron, lead, raw silk, esparto grass, wine, brandy, and fruits.

MALARIA, MIASMATA. A class of diseases among which intermittent and remittent fevers occupy a prominent place, have been known from a very early period to be especially prevalent in marshy districts, where they are promoted at particular seasons by certain conditions of heat and moisture. The nature of the noxious agents by which these results are produced has not yet been clearly ascertained; but they are known to be the product of vegetable decomposition. The decomposition of animal tissues gives rise to similar miasmata, by which such diseases are often promoted in towns, and cholera has been traced to a similar origin. The vegetable miasmata productive of malaria are most abundant in the deltas and on the banks of tropical rivers. They are capable of being carried by winds, but do not ordinarily appear to extend very far beyond the range of the producing causes. In Italy an altitude of 1500 feet, and in the West Indies of 2000 feet, is considered sufficient to escape their influence. During the Walcheren expedition it was ascertained that the horizontal spread of the miasmata over fresh water was under 3000 feet. The spread of the malaria is

arrested in a marked manner by trees, and it has been observed that it will not penetrate populous cities. This observation is, however, open to some exception, as district after district of Rome has been successively invaded by it, particularly after ecclesiastical avarice had caused the destruction of the woods by which it was formerly surrounded. In the tropics it is found to be greater over salt water; on land it varies with soil, cultivation, and other circumstances. The greater the degree of heat the more favourable apparently is the condition for the development of the miasmata, although a minimum of sixty degrees has been found sufficient to produce them. It is otherwise with moisture. Probably owing to their volatile nature an excess of moisture is unfavourable to their production, so that a rainy season will develop them in dry situations, and arrest them in moist ones. Chemical analysis has failed to detect the exact form of the noxious constituents in the air infected with malaria, which presents the same gases in the same proportions as ordinary air. It has, however, been rendered highly probable that they are volatile particles suspended in the vapour of the atmosphere.

Among the districts of Europe infected with malaria Rome and its neighbourhood is by far the most celebrated. (See CAMPAGNA DI ROMA.) The landes in France, and the district of la Sologne, an uncultivated region in the departments of Cher, Loir-et-Cher, and Loiret, in which arid and marshy tracts alternate, is also exposed to it. The season in which malaria chiefly prevails in Europe is in autumn, after the crops are gathered. Then all the conditions of heat, moisture, and vegetable decay combine in fullest measure. When the affected tracts are cultivated the peasants then abandon their houses and seek a refuge in the nearest healthy villages. The children under fourteen of the inhabitants of infected districts have been known to exhibit all the symptoms of premature old age. When they attain the age of fourteen they are less liable to the deleterious influence. Geologists have observed that malaria is most severe in districts with a basaltic subsoil, but this observation is merely incidental. Various attempts have been made since the time of Julius Cæsar to reclaim the marshes in the Campagna of Rome and render them cultivable, particularly by Decius under Theodoric, by Pius V. and by Pius VI. Under the last named a part was reclaimed and colonized, but the malaria returned, and it had to be abandoned. The Italian government has resumed the effort, particularly with the marshes of Ostia and Maccarese; and with the resources of modern engineering, has probably a better prospect of success. Trenches have been dug which conduct to the Tiber and the Arrone the waters of the higher lands. The lower lands are drained by steam-machines. It is proposed to elevate the lower lands by dredging and conveying thither the deposit of the rivers, while at the same time augmenting their current. Field-drainage and cultivation are also encouraged.

MALAY, INDIAN, ASIATIC, or EASTERN ARCHIPELAGO, the greatest group of islands on the globe, whether considered with respect to their number or extent; situated to the south-east of Asia, and washed on the west by the Indian and east by the Pacific Ocean. The archipelago may roughly be said to lie between the meridians of 95° and 135° E., and the parallels of 11° S. and 17° N. Within the limits here pointed out lie some of the largest and finest islands in the world, as Borneo, Sumatra, above 1000 miles in length; Java, Celebes, Luzon, &c. The fertile and cultivated islands of less size on the coasts of Sumatra and Java, or extending east to the Moluccas or Spice Islands inclusively, are as follows:—Nias, Mantwi, Poggy, Billiton, Banca, Madura, Bali, Lombok, Sumbawa, Comodo, Sandal-wood Island, Flores or Mangarai, Timor, Ceram, Booroo, Gillolo, Mindanao, Palawan, Negros, Samar, Mindoro, Panay, Leyte, and Zebu. The small islands may be truly called innumerable, for there are numerous groups throughout the archipelago, consisting each of hundreds of islands; many of them celebrated by the natives for their beauty and fertility, which have never been surveyed. Some include in the archipelago not only New Guinea, or at least its western peninsula, but also the Peninsula of Malacca. With the exception of the islands of Penang, Singapore, and Labuan, which belong to Britain, the Philippines, which belong to Spain, the north and north-west portion of Borneo, the Sooloo, and some other islands, which are under native potentates, and Sarawak, in Borneo, which has an English ruler, though it is not a British possession, the archipelago is really or nominally under the sway of Holland, and this portion is frequently called the Dutch East Indies.

The islands which, in close array, form the south line of the archipelago, are all mountainous, and the chief summits are volcanic. Many of them, indeed, are still active volcanoes. It would appear, then, as if this very long and narrow ridge of land had been raised from the ocean by the agency of subterranean fires. The line of volcanic action may be traced, on the west side, through Sumatra to Chittagong, in the Bay of Bengal. On the east side it reaches the meridian of 130° E., nearly under which are the little volcanic islands of Nila and Seroa, in the Sea of Banda. It then inclines north-west. The little islands lying on the west of Gillolo are all volcanic. Thence the volcanic line may be traced through the Philippines and Japan to Kamtchatka.

The islands are arranged in chains or in groups, leaving a number of open spaces or seas, often difficult of access, but the navigation of which is favoured by constant winds and a general exemption from tempests. These seas, within the archipelago, are chiefly the China Sea, between Borneo and the Malayan peninsula; the Java Sea, between Java and Borneo; the Sea of Celebes, between this island, Borneo, Mindanao, and the Sooloo Archipelago. Northwest of the last-named barrier, between Borneo, the middle islands of the Philippine group, and Palawan, is the Sooloo Sea. South of Celebes is the Sea of Flores; and further east the Banda Sea, south of the Moluccas. The Straits of Macassar, between Borneo and Celebes; the Molucca Passage, Pitt's Passage, and the Gillolo Passage may be added to the list of narrow seas. The last-named passage, and Dampier's Strait, by the coast of New Guinea, are the principal entrances to the Indian Archipelago from the east, while the Straits of Malacca and of Sunda give access from the west; and the Straits of Lombok, Allas, Ombai, &c., from the south. See separate articles on the principal islands or groups.

MALAYS, the name of a race of people spread over all the Asiatic Archipelago, and claiming to have their native country in the Highlands of Sumatra, where they established the once powerful state of Menangkabo, now subject to the Dutch. The civilization of India appears to have extended itself to the Malays at an early date. In the thirteenth century we find the Malays on the Peninsula of Malacca, where they built a city of the same name, and founded an empire. Their sultans had subdued Sumatra previously to their settling in Malacca. They afterwards possessed themselves of the rest of the Sunda Isles, of the Philippines, the Moluccas, and some of the Australian groups, where Malay tribes are found resembling, in their features, religion, and government, the Malays of Malacca. At that

time they acted a splendid part in Asia; they carried on commerce, in part, with their own ships, and planted colonies. Great numbers of ships from China, Cochin China, Hindustan, and Siam filled the harbours of Malacca. They are now divided into distinct tribes, without any general head. This is partly owing to the superiority which the Europeans, particularly the Dutch, have obtained in the Indian seas, and partly to the feudal system of the Malays, by which the national power has been divided, and a common spirit prevented by the increasing power of the vassals. The superior vassals obey the sultan or supreme commander only when they please, and the vassals under them have similar liberty. The great body of the nation consists of slaves; their masters are the *oramlai* or nobility, who are independent, and sell their services to him who pays them best. The civilized Malays profess the Mohammedan religion. Besides the Koran, the Malays have various local laws; each state has its own, relating chiefly to commerce. The maritime code of Malacca was collected as early as 1276, and confirmed by Mohammed Shah, sultan of the country. They are said to be fierce and warlike, always bearing arms, and much addicted to the use of force, treacherous in their alliances, and addicted to piracy. The Malay language is the language of commerce on all the shores of Eastern India, and is very extensively used as that of literature and of correspondence. For an account of the divisions and physical peculiarities of the Malay race see ETHNOLOGY.

MALCOLM, SIR JOHN, a distinguished soldier and diplomatist, was born near Langholm, in Dumfriesshire, on the 2d of May, 1769. He entered in 1782, as a cadet, the service of the East India Company, and under the superintendence of his uncle, Dr. Paisley, soon acquired an intimate acquaintance with the Persian language. Having distinguished himself at the siege of Seringapatam in 1792, he was appointed by Lord Cornwallis Persian interpreter to a British force serving with a native prince. In 1795, on his return from a short visit to his native country on account of his health, he performed some useful services in General Clarke's expedition at the Cape of Good Hope. In 1797 he was made captain; and from that time to 1799 he was engaged in a variety of important services, terminating at the fall of Seringapatam. He was then appointed joint secretary with Captain (afterwards Sir Thomas) Munro to the commissioners for settling the new government of Mysor. In the same year he was selected by Lord Wellesley to proceed on a diplomatic mission to Persia, where he concluded an important political and commercial treaty, returning to Bombay in May, 1801. In January, 1802, he was raised to the rank of major; and on the occasion of the Persian ambassador being accidentally shot at Bombay he was again intrusted with a mission to that empire, in order to make the requisite arrangements for the renewal of the embassy, which he accomplished in a satisfactory manner. In January, 1803, he was nominated to the Presidency of Mysor, and in December, 1804, he was promoted to the rank of lieutenant-colonel. In the June of the following year he was appointed chief agent of the governor-general, and he continued to serve in that capacity until March, 1806, having successfully concluded several very important treaties during that period. Upon the arrival in India in April, 1808, of the new governor-general, Lord Minto, Malcolm was sent to the court of Persia on a mission. Early in the year 1810 he was again selected to proceed in a diplomatic capacity to the court of Persia, whence he returned upon the appointment of Sir Gore Ouseley as ambassador. In 1812 Malcolm again visited England, shortly after which he received the honour of knighthood. He returned to India in 1816, and soon became engaged in extensive political and military duties. After the termination of the war with the Mahrattas and Pindarees, to which his services had eminently contributed, he was employed by Lord Hastings in visiting and settling the distracted territories of Mulhar Rao, which he successfully accomplished, gaining to British India a large accession of territory and treasure. Sir John returned to Britain in April, 1822, with the rank of major-general. During this visit he received an acknowledgment of the utility of his public career in a grant from the East India Company of £1000 per annum. He had quitted India with the determination to spend the evening of his life in his native country; but the solicitations of the court of directors, and of his majesty's ministers for Indian affairs, induced him again to embark in the service of his country. In July, 1827, he was appointed governor of Bombay, which post he continued to fill until 1831, when he finally returned to Britain, having effected, during the few years of his governorship, incalculable benefits for this country, its Indian territories, and every class of the inhabitants there. Shortly after his arrival in England in 1831 he was returned to Parliament for the borough of Launceston. His death took place in London, 31st May, 1833. As an author his principal works are—A Sketch of the Sikhs, a singular nation in the province of the Punjaub, in India; The History of Persia, from the earliest period to the present time; Sketches of Persia; A Memoir of Central India; and his treatise on the Administration of British India. Sir John had also been engaged for some time before his death in writing a life of Lord Clive, which appeared in 1836.

MALDIVE ISLANDS (Thousand Isles), a remarkable chain of islands in the Indian Ocean, at the entrance to the Arabian Sea, extending from lat. 0° 40′ S. to 7° 6′ N., nearly on the meridian of 73° 30′ E., with a breadth of about 50 miles. The chain is composed of seventeen atolls—that is, circular or oval groups of coral islets, and fringed with reefs, sometimes extending to the distance of 2 or 3 miles, beyond which there are no soundings at immense depths; but in the centre of each atoll there is a lagoon from 15 to 49 fathoms deep. The larger islands are richly clothed with wood, chiefly palm, and are fertile in fruit, and in various kinds of edible roots; they also produce millet, and abound in cocoa-nuts, fowls, and all descriptions of fish. The inhabitants are a civilized race of people, and carry on a considerable trade with the British possessions in India; more particularly Bengal, Ceylon, and the Malabar coast; as also to the Red Sea and to Sumatra; exchanging cowries, which are plentiful in the Maldives; coir, mats, oil, fish, tortoise-shell, &c., for rice, sugar, tobacco, and manufactured goods. They are expert navigators and sailors, and have schools for teaching navigation on some of the islands; and they make and repair nautical instruments. They are a timid, inoffensive people, of a dark copper colour, and rather short in person. They are remarkable for their hospitality and kindness to shipwrecked mariners, for which they refuse all pecuniary compensation. They are governed by a sultan, whose title and rank are hereditary; he resides in the island of Male or Mohl, and pays annual tribute to the British government in Ceylon. Pop. 150,000 to 200,000.

MALDON, a municipal and parliamentary borough, port, and market town, England, county of Essex, 36 miles north-east of London, on a branch of the Great Eastern Railway, and on the ridge of a hill on the right bank of the Blackwater, near the confluence of the Chelmer. It consists chiefly of one spacious street, upwards of 1 mile in length, east to west, with

[illegible] of an antiquated appearance, but also [illegible] It has a [illegible] of the time of Henry VI: two [illegible] a [illegible] in the early Norman and [illegible] with a [illegible] of Norman architecture, [illegible] by a [illegible] and [illegible] of wrought [illegible] Dissenting books, a few [illegible] and [illegible] with [illegible] and [illegible] and several charities. The [illegible] by the bay of the Blackwater [illegible] safe and [illegible] to [illegible] drawing more than [illegible] feet water; value of [illegible] [illegible] and [illegible] and [illegible] their cargoes by means of lighters. The import trade consists [illegible] in [illegible] There is also a [illegible] fishery, and [illegible] of [illegible] quality are taken in the [illegible] The port is of considerable [illegible] to the [illegible] coast, and much of the adjoining country is supplied through it. The borough sends one member to parliament. Population (1851) of [illegible] 2,865; of parish, 7,145.

MALEBRANCHE, NICOLAS, a French philosopher, was born in 1638 at Paris, where his father was secretary to the king and president of the chamber of accounts. His health being delicate he was constantly instructed by a domestic tutor, but afterwards went through courses of philosophy and divinity at the colleges of La Marche and of the Sorbonne. At the age of twenty-two he determined to embrace the monastic life, and was admitted into the congregation of the oratory. He applied himself first to ecclesiastical history, and afterwards to oriental learning and biblical criticism; but having accidentally met with Descartes' treatise De Homine he determined to make himself master of that author's system of philosophy. The result of this study was his famous treatise De la Recherche de la Vérité, first printed in 1673, but of which the best edition is that published by himself in 1712, in two vols. 4to, and four vols. 12mo. The doctrines of this celebrated work, which contains fine thoughts and uncommon reflections, rendered still more striking by his chaste and elegant style, are founded upon Cartesian principles, and are in some particulars Platonic. It is principally distinguished by the maintenance of a mysterious union between God and the soul of man, and the doctrine that the human mind immediately perceives God, 'and sees all things in him.' His next publication was Christian Conversations (1676). This was followed (in 1680) by a Treatise on Nature and Grace, which led to several controversial pieces between him and Arnauld. Father Malebranche also wrote several works on physical subjects, and several papers for the Academy of Sciences, of which he was admitted an honorary member in 1699. His death, which took place in 1715, was hastened, it is said, by the excitement caused by a keen debate he had had with Bishop Berkeley. As a philosopher, although he agreed with those who preceded him in conceiving ideas to be the immediate objects of perception, he distinguished more than any previous metaphysician the object from the sensation which it creates, and thereby led the way to a right understanding both of our external senses and mental powers.

MALESHERBES, CHRETIEN-GUILLAUME DE LAMOIGNON DE, an eminent French statesman, was the son of Guillaume de Lamoignon, chancellor of France, and was born at Paris in 1721. After studying at the Jesuits' college he qualified himself for the legal profession, and became a counsellor of the parliament of Paris. In 1750 he succeeded his father as president of the Court of Aids, and was also made superintendent of the press, in both which offices he displayed a liberal and enlightened policy highly honourable to his talents and character. On the banishment of parliament and the suppression of the Court of Aids in 1771 Malesherbes was exiled to his country seat, where he devoted his leisure to the study of botanics and agriculture, and the improvement of his estate and of the country around it. After the accession of Louis XVI. he resumed his presidency over the revived tribunal, and in 1775 was appointed minister of state. Finding his plans for the benefit of the nation counteracted by the influence of others he resigned his post in May, 1776, and went to reside in Switzerland. He was recalled by the king's counsels in 1787, when he drew up two memoirs, on the Liberties of France, and the Means of Repairing them; but his advice was rejected, and he therefore took a final leave of the court. Returning to the country he continued his patriotic labours, and in 1788 published an Essay on the Means of accelerating the Progress of Rural Economy in France. He took no part in the proceedings which led to the overthrow of the monarchical government; but on the decree of the national convention for the trial of the king, he emerged from his retreat to become the voluntary advocate of his unfortunate sovereign. His generous attachment to his fallen master excited the jealousy of the French rulers, and caused his destruction. Shortly after his return home, his daughter, Madame de Rosambo and her husband were arrested and conducted to Paris; and his own arrest, with that of his grandchildren, soon followed. Almost his whole family were extirpated by the merciless proscription of his persecutors. Malesherbes was beheaded April 22, 1794, and he bore his sufferings with a spirit worthy of his life. Louis XVIII. ordered a monument to be erected to him in the great hall of the Palais de Justice.

MALIBRAN, MARIA FELICITA, one of the greatest singers of modern times, born at Paris in 1808, was daughter of the well-known singer and singing master Manuel Garcia. All the efforts of her father to train her had appeared to be in vain, when, at the age of thirteen, a complete change suddenly took place, and her talent became developed with extraordinary rapidity. At the age of fourteen she gained her first triumph at the Italian opera in London, to which her father had proceeded, and in a short time her fame was European. Meanwhile her career was interrupted by an episode which had a very decided influence on her life. She had gone with her father to New York with a troupe of Italian singers. The enterprise failed, and her father being brought into difficulties, she accepted the hand of a Frenchman named Malibran, who was regarded as a very wealthy merchant, but proved to have been on the eve of bankruptcy. She had left the stage, but felt it necessary to resume it, after separating from her husband on the ground of incompatibility of temper. She returned to Europe, and was received with equal enthusiasm in England, France, and Germany. In private life she distinguished herself by an almost unbounded, and too often ill-judged beneficence, and expended her gains as readily as she made them. In 1833 she began to make professional tours with the Belgian violinist Beriot, and having obtained a divorce from her first husband, married him in 1836. In September of same year she was prematurely cut off at Manchester, whither she had gone to take part in a musical festival. Her body was afterwards removed to Brussels, where a monument has been erected to her. She possessed some skill as a composer, and produced a number of songs which obtained considerable popularity.

MALIC ACID. The juice of many vegetables, when not fully ripe, was found by Scheele in 1785 to contain a peculiar acid. From further researches upon this substance Liebig was led to assign to it the

formula $C_4H_6O_5$. This acid is contained in unripe apples (hence the name, from Latin *Malum*), in the barberry, sloe, and elder, in gooseberries, cherries, strawberries, &c. &c.; it is also found in the roots of marsh-mallow, angelica, liquorice, primrose, and madder, in carrots and potatoes, and in the leaves and stems of tobacco, poppy, sage, and a great many other plants. Malic acid may be prepared by partially saturating the acid juice expressed from the berries of the mountain ash with potassium carbonate, adding lead nitrate, digesting the precipitate of lead malate with water to free it from the colouring matter which it has carried down, decomposing the lead malate by means of dilute sulphuric acid, neutralizing the filtrate, after removal of insoluble lead sulphate, with ammonia, and, lastly, decomposing the ammonium malate so obtained by sulphuretted hydrogen. Malic acid may be obtained in colourless, shining, needle-shaped crystals, which have a sour taste, and deliquesce in the air. An aqueous solution of this acid rotates the plane of a ray of polarized light to the right.

Malic acid is generally regarded as dibasic and triatomic—that is, as containing two hydrogen atoms which are replaceable by metal, but three hydrogen atoms which are replaceable by alcoholic radicals; thus we have for the malates the general formula $C_4H_4M_2O_5$, where M = a monatomic metal; while for the ethers of this acid the general formula becomes $C_4H_3M_3O_5$, where M = a monatomic alcohol radical. By oxidation malic acid is converted into *malonic acid*, while by the action of reducing agents *succinic acid* is produced.

MALINES. See MECHLIN.

MALLARD. See DUCK.

MALLEABILITY, the property of extending under the blow of a hammer; it is almost restricted to metals. For every metal there is a certain temperature at which it is most malleable; for instance, iron is most malleable at a white heat. The following is the order of malleability of the metals:—Gold, silver, copper, platinum, iron, aluminium, tin, zinc, lead. Ductility and malleability are nearly allied, but they are seldom possessed in the same proportion by the same metal. See DUCTILITY.

MALLET, DAVID, a miscellaneous writer, was born in Crieff, Perthshire, about 1700. He studied some time at Edinburgh and Aberdeen, and became tutor in the family of the Duke of Montrose. In 1723 he accompanied the Duke's family to London, where he published in 1724 his well-known ballad of William and Margaret and formed the acquaintanceship of many of the leading literary men of the period, including Young and Pope. When he began to acquire a little fame he altered his family name of Malloch to Mallet, as being more euphonious to English ears. In conjunction with Thomson he wrote in 1740 the mask of Alfred, a slight dramatic performance, in which, however, occurs the national song of Rule Britannia, to which Mallet, at least indirectly, laid claim. He obtained munificent gifts, profitable sinecures, and state pensions by his sycophancy towards those in power, lauding them in bombastic verse, and vilifying their enemies in scurrilous pamphlets. He died in London 21 April, 1765. All his feeble dramas and turgid poems are now deservedly forgotten.

MALLEUS (Latin, *Malleus*, a hammer), one of a series of small bones entering into the structure of the inner ear, and known as the *auditory ossicles*. It is so named from its somewhat hammer-like shape, and is attached on one side to the *tympanic membrane*, or that of the drum of the ear; and on the other side articulates with the *incus*, another of the auditory ossicles. See EAR.

MALLOW (*Malva*), a genus of plants of the natural order Malvaceæ. The Common Mallow (*M. sylvestris*) is a handsome plant, with an erect stem and kidney-shaped leaves, having seven deeply crenate lobes; the flowers are large, and of a purple or a rosy colour; the calyx hairy, with reticulate-rugose seeds. It grows spontaneously on roadsides and waste places in Britain. The Dwarf Mallow (*M. rotundifolia*) is also a native of Britain. Its stems are short, simple, spreading widely around, rising from a long, deeply buried root. Its leaves are of a handsome, round, heart-shaped form, somewhat lobed and crenate on their edges; the flowers white, violet white, or purplish. These two plants have a mucilaginous and somewhat bitter taste, and their leaves are used as an emollient and demulcent medicine. The Musk Mallow (*M. moschata*) is also found in Britain; it has handsome deeply-cut leaves, which diffuse a pleasant musky odour, and large rose-coloured flowers. The fibre of *M. crispa* is sufficiently tenacious to be used in making cordage. The raw cotton of commerce is the hairy covering of the seeds of certain malvaceous plants. Dyes are likewise to be found among this extensive order of plants.

MALLOW, a parliamentary borough and market town, Ireland, in the county of Cork, 18 miles north by west of Cork, on the left bank of the Blackwater, connected with the suburb of Ballydaheen by a bridge of three arches, is noted for its mineral waters, and the scenery of its environs. It has an infirmary, court-house, bridewell, union workhouse, spa, clubhouses, and barracks, some of them neat buildings; a Protestant church in the later English style; a Roman Catholic chapel, and places of worship for Independents and Wesleyans. There are salt-works, flour-mills, condensed milk manufactory, breweries, and tanneries. The borough sends a member to Parliament. Pop. in 1881, 4439.

MALMESBURY, a parliamentary borough and corporate town of England, county of Wilts, on a hill, and nearly surrounded by two branches of the Lower Avon, over which there are six bridges, 23 miles N.E. of Bristol. It consists chiefly of four well-built streets, and has a magnificent Norman church originally the nave of the church belonging to an ancient monastery; another parish church, a town-hall and market-house, an old borough hall, and an old octagonal market-cross. King Athelstan was buried in the abbey, which contains a fine tomb to his memory. The chief industries are ribbon-weaving, employing several hundred hands; pillow-lace making, brewing, malt-making, and tanning. It sends a member to Parliament. Among its natives is Hobbes, the philosopher. Pop. 6881.

MALMESBURY, WILLIAM OF, an English historian of the twelfth century, was born probably in Somersetshire about the year 1075. He received his education at the Benedictine Abbey of Malmesbury, and subsequently became librarian and precentor of the abbey. He studied all the sciences of his time, but attached himself particularly to history, and finding that a satisfactory account of his own country was wanting, he determined to write one, 'not,' as he himself says, 'to display his learning, which is no great matter, but to bring to light things that are covered with the rubbish of antiquity.' His De Gestis Regum Anglorum is a general history of England, in five books, from the arrival of the Saxons in 449, to the twenty-eighth year of the reign of Henry I., in 1128; he also wrote a modern history, in two books, from that year to the escape of the Empress Maud from Oxford, in 1143; with a church history of England, De Gestis Pontificum Anglorum, in four books, published in Sir H. Saville's collection (1596). He discovers great diligence, good sense and

modesty. His Antiquities of Glastonbury was printed by Gale, and his Life of St. Aldhelm by Wharton. He died in 1148.

MALMÖ, a seaport of Sweden, on the Sound, capital of the laen of Malmöhus, and situated in one of the most fertile districts of Sweden. The town is well built, with broad, straight streets, and a large square surrounded by trees. The principal buildings are two churches, the old castle, and the town-house. The town contains a high-school, a school of navigation, and several charitable institutions. The manufactures consist of tobacco, silk, sugar, gloves, leather, iron-work, &c. The chief exports are grain, timber, tar, oil-cake, &c. Pop. 38,054.

MALMSEY WINE is a sweet wine, made from a grape originally brought from Malvasia or Malvoisie in the Morea. Much of the wine called Malmsey used to be made from a grape grown on rocky ground, in Madeira, exposed to the full influence of the sun. It is left to hang about a month later than the grapes used for the dry wines, and is not gathered until partially withered.

MALO, St., a town and seaport of France, department of Ille-et-Vilaine, on the rocky island of Aron, communicating with the mainland by a long causeway, called Le Sillon, 49 miles north-north-west of Rennes. The whole area of the island is occupied by the houses, and the walls flanked with towers, rising up directly from the water's edge, are washed by the sea. The ramparts furnish a fine walk, which makes the whole circuit of the town; but many of the streets are very narrow, and the houses, closely crowded together, are so high as to exclude a free circulation of air. Among the public buildings may be mentioned the cathedral, a Gothic structure, and the ancient castle. The harbour is formed by the mouth of the Rance, the island, and causeway. It is difficult of access, being encumbered at its entrance by shoals, and dry at ebb; but within is safe, large, and very commodious, with a broad quay, running close under the walls. It has manufactures of hosiery, fishing-nets, sail-cloth, cordage, soap, and fishing-hooks, and also ship-building; a trade in corn, fruit, wine, brandy, salt provisions, tobacco, cider, honey, flax, hemp, and agricultural produce. St. Malo ranks as a fortress of the second class, and possesses courts of first resort and commerce, a custom-house, a consulting chamber of manufactures and trade, a first-class school of hydrography, and an agricultural society. Pop. (1881), 11,212.

MALONE, EDMUND, a commentator and editor of Shakspere, was born at Dublin in 1741. After completing his studies at Trinity College he entered at the Inner Temple, London, and was called to the bar in 1767. Possessing a competent fortune he gave up his profession, and employed himself in literary pursuits. After having been the coadjutor of Steevens in his edition of Shakspere's plays, Mr. Malone quarrelled with that gentleman, and published an edition of his own, in eleven vols. 8vo, 1790. He also published an Inquiry into certain Papers attributed to Shakspere, but in reality written by William Henry Ireland; a History of the English Stage; biographical memoirs of Sir Joshua Reynolds, Dryden, W. Gerard Hamilton, &c. He died May 25, 1812.

MALPIGHI, MARCELLO, an eminent Italian physician and anatomist, was born in 1628 near Bologna, and studied in the university of that city. He was admitted M.D. in 1653, and three years after was appointed to the medical chair. The Grand-duke of Tuscany invited him to become professor of medicine at Pisa, where he stayed three years, and in 1660 returned to occupy his former office at Bologna. He was tempted by a high stipend to accept the professorship of medicine at Messina, in Sicily; but the jealousy of his colleagues rendered him uneasy, and he again settled at Bologna in 1669. He was elected a fellow of the Royal Society of London in 1668, and communicated to that association various anatomical discoveries relative to the minute structure of animal bodies, the results of microscopical observations. Pope Innocent XII. in 1691 called him to Rome, and appointed him his physician, chamberlain, and domestic prelate, which posts he held till his death, in 1694. His works, relating to anatomy, physiology, and vegetable anatomy, comprise much curious and important information on the brain, the nerves, the spleen, the uterus, &c.; also on silkworms, the formation of the fœtus in the egg, on glands, on the anatomy of vegetables, &c. His complete works have been often published (London, 1687, &c.) His posthumous works were published at London (1697, folio), and republished at Venice and Leyden.

MALPIGHIAN BODIES AND CORPUSCLES. See KIDNEY and SPLEEN.

MALPLAQUET, BATTLE OF (Sept. 11, 1709), the bloodiest in the war of the Spanish Succession, gained by Marlborough and Eugène, the commanders of the allies, against the French under Villars. After the capture of Tournay the allies wished to invest Mons, the capital of Hainault. To prevent this Villars marched against them: an older marshal, the noble and valiant Boufflers, served under him as a volunteer. The French army was 70,000 strong, with eighty pieces of cannon. The allies, who numbered about 80,000 men, with 140 pieces of cannon, commenced the attack near the wood in the neighbourhood of the villages of Blangies and Malplaquet. Marlborough commanded the British troops, and the German troops in the British pay, on the right wing. Eugène led the centre; Tilly and a Count Nassau the left wing, where the Dutch were stationed. Villars commanded the left wing of the French forces; Boufflers the right. The left wing of the allies was put to flight, and Marlborough had to struggle against the most furious attacks upon the right. The Pretender, son of James II., chevalier St. George, charged twelve times at the head of the French cavalry. Villars then weakened his centre by despatching reinforcements for the left wing. At this crisis Eugène advanced, stormed the intrenchments which covered the enemy's centre, and drove back the guards. The marshal hastened thither, but too late; he was wounded himself; his centre was broken through and the wings separated. The battle was lost. The field was covered with about 30,000 dead and dying. The French lost hardly 10,000, the allies more than 20,000. Boufflers conducted the retreat in good order between Le Quesnoy and Valenciennes. The allies immediately laid siege to Mons, which fell into their hands.

MALT, a substance produced by the partial artificial germination and subsequent drying of grain, especially of barley, whereby the starch of the grain is converted into sugar. One hundred parts of barley yield about ninety-two parts of air-dried malt. See BEER and BREWING.

MALTA (anciently *Melita*), an island in the Mediterranean belonging to Britain, 62 miles S.S.W. of Sicily, and 197 miles north of Africa; length, north-west to south-east, 17 miles; central breadth, about 9 miles; area, 98 square miles. It is of an irregular oval shape, deeply indented on all sides except the south, where the coast forms a continuous and almost unbroken line. The largest bays are those of Marsa and Scirocco on the south-west, and Melleha and St. Paul's on the north-east; but the most important in every respect is the double bay, formed by the opposite sides of the remarkable peninsula on which

the capital, Valetta, stands. The south-west coast is remarkably bold, and having not a single opening in which a vessel can take refuge, is considered dangerous; the north coast has a more level shore. The elevation, however, is not great. The culminating point, which occurs near the south-west coast, does not exceed 1200 feet, and from this point the surface presents the appearance of an inclined plane, sloping with more or less rapidity towards the north-east shore. The rocks are all stratified and arranged in nearly parallel layers, with a very gentle dip, generally north-east to east by north. They are disposed in four distinct groups, the uppermost being coral limestone, the next yellow sandstone and blue clay, the third sandstone, and the last a yellowish-white semi-crystalline limestone, of great thickness, and from its hardness and durability forming an excellent building stone. The climate on the whole is good, and from the middle of October till that of January cannot be surpassed; but in summer the heat becomes extreme, and the bright light reflected from the bare white rocks and houses is very annoying, and often injures the sight. There are no lakes or proper running streams in the island, but the springs are so numerous and copious that no deficiency of water is felt. The soil is very thin, and lying on a calcareous rock, which is continually showing itself above the surface, is unfit for general cultivation. Only a small quantity of corn is raised, the staple product being cotton, for which both soil and climate are well adapted. Both the vine and olive are cultivated, but the produce of both is inferior. Fruit, particularly figs and oranges, is very abundant, and of excellent flavour. The manufactures consist chiefly of cotton goods, cabinet-work made for exportation, chiefly to Greece and the Ionian Islands; and jewelry, including neck-chains and gold filigree-work, for which the Maltese have long been famous. Other minor articles of manufacture are soap, leather, macaroni, &c. The central position of Malta in the Mediterranean makes it, particularly in war, an important commercial depot, and at all times an invaluable naval station. It has, in consequence, received great attention from the British government, and been both provided with excellent docks and very strong fortifications. The language commonly spoken is Italian, but the native Maltese have a peculiar dialect closely resembling the Arabic. Malta appears very early, and makes a considerable figure in history. It passed successively through the hands of the Phœnicians, Greeks, and Carthaginians, and was finally attached to Rome during the second Punic war. After the fall of the Roman Empire it was seized at different times by Vandals, Goths, and Saracens. From the last it passed to Sicily, and followed its fortunes till 1522, when Charles V. granted it to the order of St. John of Jerusalem. In 1798 the Grand Master, Hompesch, surrendered it without defence to Napoleon. It was afterwards blockaded by Nelson, and taken after two years. It is now a formally recognized possession of Great Britain. Pop. (1881), 150,524.

MALTE-BRUN. See BRUN.

MALTHUS, REV. THOMAS ROBERT, a celebrated English political economist, born in 1766 on a small estate belonging to his father in the vicinity of Guildford, in the county of Surrey, received his first education chiefly in private, and in 1784 entered Cambridge, where he took his degree of M.A. in 1797, and was made fellow of his college. In 1798 he published his Essay on the Principle of Population. Considering the materials which he had possessed in composing it as imperfect, he resolved to increase them by foreign travel, and accordingly, in 1799, he made a tour through Sweden, Norway, Finland, and part of Russia. In 1802 he travelled through France and Switzerland, and in 1803 he published an improved and much enlarged edition of the Essay. In 1804 he was appointed professor of history and political economy in the East India College at Haileybury, and continued faithfully to discharge the duties of this chair till his death at Bath in 1834. In the Essay on Population, on which his fame chiefly rests, the leading principle, which had been recognized by several preceding writers, but had never before been so fully developed, is that while as a general rule the means of sustenance increase only in the arithmetical ratio of 1, 2, 3, 4, &c., the population increases in the geometrical ratio of 1, 2, 4, 8, &c., and that, consequently, society is doomed to a perpetual struggle to find food equal to the number of its mouths. According to him the great natural checks to this excessive increase of population are vice, misery, and moral restraint; and the great business of the enlightened legislator is to diminish the first two and give every encouragement to the last. This doctrine attracted very general notice, and has been the subject of much able and keen discussion. Besides the Essay Mr. Malthus wrote various other works on subjects connected with political economy, as a Letter to Samuel Whitbread on the Amendment of the Poor-laws, Observations on the Effects of the Corn-laws, An Inquiry into the Nature and Progress of Rent, Principles of Political Economy, and Definitions in Political Economy.

MALTON, or NEW MALTON, an ancient borough and market town of England, in the county of York, and 16 miles north-east of the city of that name, on the right bank of the Derwent, on the York and Scarborough Railway. It consists of several streets diverging from a central area or market-place. The houses are generally well built, many of them handsome. It has a neat town-hall, a mechanics' institution, a handsome suite of public rooms, to which a subscription library and news-room are attached; two ancient churches, one in the Norman and the other in the later English style, also places of worship for various Dissenting bodies and Roman Catholics; and several schools. There are some large breweries here, all of which use water derived from a large spring, which also supplies the water-works. Considerable quantities of agricultural produce are conveyed hence by railway to Hull, Leeds, Wakefield, and London. Malton returns one member to Parliament. Pop. in 1881, 8751.

MALVERN, GREAT, a town of England, in the county of Worcester. It is one of the most celebrated and fashionable watering-places in the kingdom, 8 miles S.W. of Worcester, finely situated on the east side of the Malvern Hills. It is irregularly built, but is surrounded by beautiful villas and handsome mansions, and has good gardens, walks, and drives. The hotels, boarding and lodging-houses, are all of an excellent description, and the accommodation for bathing and for drinking the waters good. It has a county court. The library is a handsome building in the Italian style. There are several schools, including a proprietary college and grammar-school. The Priory Church, formerly that of the Benedictine monks, is a fine specimen of ecclesiastical architecture; it has a fine embattled tower, with windows of richly stained glass. At one time there was a celebrated monastery here, founded in the time of Edward the Confessor, the gateway of which still remains. Pop. in 1881, 7935.

MALWAH, an old Mohammedan province of Hindustan, presidency of Bengal, mostly between lat. 22° and 25° N. and lon. 74° and 79° E., and now included in the estates of Bhopál, Gwalior, Indor, &c. It is rather an elevated region, its centre consisting

of a tableland or plateau, in general open, but diversified with conical table-crowned hills. Few of its elevations, however, exceed 2000 feet. The savage tribe called Bheels are numerous in this territory, chiefly occupying the mountains contiguous to the Narbada. In appearance they are a diminutive race, but active, and capable of undergoing great fatigue. Many of them have been tamed and enlisted in the British army, the headquarters of the Bheel corps being at Sardarpur.

MAMELUKES, MAMLOUKS, or MAMALUKES (from the Arabic *memalik*, a slave), in Egypt, slaves from the Caucasian countries, who from menial offices were advanced to dignities of state. When Gengis-Khan made himself master of the greatest part of Asia in the thirteenth century, and carried vast numbers of the inhabitants into slavery, Nedjmeddin (Malek Salah), sultan of Egypt, bought 12,000 of them, including natives of Mingrelia and Circassia, but chiefly Turks from Capchak (Kipzak), had them instructed in the military exercises, and formed a regular corps of them. They soon exhibited a spirit of insubordination and rebellion. Under his successor they interfered in the government, assassinated the sultan, Turan Shah, and in 1254 appointed Beegh, one of their own number, sultan of Egypt. The dominion of the Mamelukes in Egypt continued 263 years. The command was usually held by the bravest of their number. During this period they made some important conquests, and in 1291 they drove the Franks entirely out of the East. Selim I. put an end to this kingdom, after having taken Cairo, the capital, by storm in 1517. He placed a Turkish pasha as governor over Egypt, but appears to have been compelled by circumstances to leave the twenty-four beys, who governed the different provinces, in possession of their power. This state of things continued more than 200 years. But from the middle of the last century the number and wealth of the Mamelukes gave them such a superiority over the Turks in Egypt that the pasha appointed by the Porte was obliged to conform entirely to their wishes. This superiority was owing principally to Ali Bey, who ruled with unlimited power from 1766 to 1773, when he was assassinated. The Mameluke beys, especially Murad Bey, played an important part at the time of the French invasion. The Mamelukes, who were scattered throughout Egypt, and estimated at 10,000 or 12,000 men, maintained their numbers, principally by slaves brought to Cairo from the regions lying between the Black and Caspian Seas. These were compelled to embrace the Mohammedan faith, and were all educated as soldiers. After a time they obtained a share in the government, and some of them even became beys, for none but Mamelukes were capable of holding this office. They formed a fine body of cavalry, and attacked the French, when they landed in Egypt, with the greatest fury; but they were unable to withstand the European artillery, and many of them soon joined the French. The Pasha of Egypt, Mohammed Ali, destroyed the Mameluke beys 1st March, 1811, by a perfidious stratagem, and immediately afterwards ordered a general massacre of the Mamelukes in every province of Egypt. Some hundreds managed to escape into Lower Nubia, where they built a small town, and endeavoured to keep up their force by disciplining negroes in their peculiar tactics. They did not succeed, however, and shortly afterwards dispersed.

MAMERS, a small town of France, in the department of Sarthe, on the Dive, about 25 miles north-east from Le Mans. There are manufactures of coarse linen, cotton, and hosiery; tanneries, breweries, tile-works, and candle manufactories; and a trade in grain, hemp, wool, and cattle. Pop. (1881), 6070.

MAMERTINES, named after Mamers, who in the Oscan and Sabine dialects is equivalent to the Roman Mars, were Campanian Samnites, who had been in the pay of Agathocles, and having been discharged after his death, B.C. 289, treacherously obtained possession of the city of Messina. Having murdered or expelled the male inhabitants they converted it into a nest of banditti and pirates, who spread the terror of their name over sea and land. At last Hiero II., having defeated them near Mylæ, where they opposed him with 8000 men, shut them up within the town. One party received the Carthaginians as their protectors, while another in 264 applied for assistance to the Romans, who sent them an army, headed by the consul Appius Claudius, and the Carthaginians were expelled. This occasioned the war between Rome and Carthage, known by the name of the first Punic war.

MAMMALIA (Latin, *mamma*, a breast), the highest class at once of the Vertebrata and of the animal kingdom, including those animals we familiarly term 'quadrupeds,' the Whales, Dolphins, and other fish-like forms, and man himself. The characters which separate the mammals primarily from other Vertebrata, and from all other animals, may be summed up in the definition that they are *Vertebrate animals possessing a typical body-covering of hairs, and which nourish the young for a longer or shorter period by the milk, a fluid secreted by special glands—the mammary or milk glands.* The nature of the *body-covering* and the possession of *mammary glands* constitute points sufficient to distinguish mammals from all other animal forms.

The *exoskeleton* of the Mammalia, or outer skeleton of the body, appertaining to the skin, exists, as already stated, in the form of hairs. These hairs are modifications of the outer or epidermal layer of the skin, and are each formed in a minute *hair-sac*, by horny matter being deposited on a small *papilla* or prominence, which arises from the *dermis* or true skin from the bottom of the sac. The whales and porpoises alone among mammals are destitute of a hairy covering, the skin in such forms being entirely naked. But even in the whales a few hairs or bristles may surround the mouth; and in other Cetaceans (for example, dolphins), which are wholly destitute of hairs when fully grown, these appendages are present in the embryonic or fœtal condition. In the Echidna, hedgehog, and porcupine, the hair-structure merges into that of strong spines. In the Scaly Anteaters (*Manis*) or Pangolins we find the integument to secrete horny scales; whilst in the Armadillos both epidermis and dermis develop hard structures; the latter secreting an armour-casing of bony plates or *scutes*, whilst the epidermis secretes horny plates which cover the bony scutes.

The *endo-* or internal *skeleton* exhibits certain variations in general conformation, in consistency with the different modes of life pursued by mammals; but throughout it exhibits a uniformity of essential structure, and in most points agrees with the conformation of man's own bony frame. The spine or vertebral column, except in the whales and allied forms, generally exhibits a division into the definite regions of neck, back, loins, sacral region, and tail, coccygeal, or caudal region. In man, certain bats, and monkeys, the lowest numbers of vertebræ are found. Man possesses seven cervical, twelve dorsal, five lumbar, five sacral, and three or four coccygeal vertebræ. The cervical vertebræ of mammals are wonderfully constant in number, being with few exceptions seven in number, as in man. Thus in the long-necked giraffe or short-necked porpoise the cervical vertebræ uniformly number seven. The most notable exceptions to this rule on the side of reduced

vertebræ are found in the manatee and a two-toed sloth (*Cholapus Hoffmanni*), in which only six are present; whilst on the side of a greater number the three-toed sloth (*Bradypus tridactylus*) may be cited, as presenting us with nine cervical segments. The hinder two neck-vertebræ in the latter instance, however, might be referred by some anatomists to the dorsal or back region. The dorsal or back vertebræ in mammals average thirteen in number. The lowest number is ten, as in Azara's Armadillo. The slow lemur possesses sixteen. The elephants have twenty dorsal vertebræ, while the two-toed sloth has twenty-four, exactly double the number found in man. The lumbar vertebræ, or those of the loins, are generally to be distinctly recognized save in whales, &c. Some monkeys have only four lumbar segments; whilst below this number the Ornithorhynchus and Echidna present us with two, and the two-toed sloth with three only. The largest numbers are found in the dolphins, where there are twenty-four lumbar vertebræ; although, as already remarked, there is great difficulty in determining the exact limits of the hinder regions of the body in the Cetacea and consequently in settling the true number of segments belonging to any given region—this difficulty being due to the rudimentary nature of the pelvis and absence of hind-limbs in these forms. The slow lemur possesses nine lumbar vertebræ, but the average number is above that of man, and appears to be seven or eight. Eight is generally the largest number of lumbar vertebræ found in higher mammals. The five sacral vertebræ in man unite to form a single bone known as the *sacrum*. This number of sacral vertebræ is rarely exceeded throughout the class Mammalia. Thus some apes have six sacral vertebræ, and the highest number is ten, found in some armadillos. In the Cetaceans, in which the pelvis is rudimentary, no sacrum exists; and the corresponding free vertebræ are inseparable from the general and unspecific arrangement of the hinder segments of the spine in these animals. The four coccygeal vertebræ of man are very small, and are appended to the lower extremity of the sacrum, to which about middle life they generally become ossified; but throughout the mammalian class these vertebræ become widely developed, and in very varying and different degrees, to become the useful 'tail' of many forms. Thus, in the long-tailed pangolin or scaly ant-eater forty-six coccygeal vertebræ exist. Thirty-three vertebræ exist in the tail of the spider-monkeys. In the magot (*Inuus*) or Barbary Ape the tail-vertebræ number three, whilst in the bats two only may exist. The first cervical vertebra or *atlas* supports the head, which fits into it by the *two* articular processes of the back-bone (occipital) of the skull—*occipital condyles*. The second cervical vertebra or *axis* possess a blunt process (*odontoid process*), on which the axis vertebra together with the skull turns. In those mammals (for example, Whales) in which there is little movement permitted between the head and neck the cervical vertebræ are ossified together, and the odontoid process is quite rudimentary. In all mammals, but especially in those which move with the body in a horizontal position, a large band of fibrous tissue stretches from the back of the skull to be attached to the spines of the cervical and dorsal vertebræ. This great elastic band is the *ligamentum nuchæ*, and upon it devolves the function of supporting the head of the animals, and of thus relieving the muscular attachments of considerable weight. In those mammals which possess long necks this ligament is most largely developed, as in the giraffe, where it extends backwards and is attached to the sacrum. The horse and elephant also exemplify mammals in which the ligamentum nuchæ is largely developed for the purpose of supporting the head. But at the other extreme, as in whales and in man, we find this structure becoming rudimentary, on account of there being little or no necessity for supporting the head. In whales the coalescence of the cervical vertebræ already pointed out, and in man the erect position, respectively annul the functions of this ligament. In some cases (as in the mole), it may become ossified by the deposition in its fibres of bony material. The cavity of the thorax or chest in mammals is bounded by the ribs. These bones vary greatly in number, but generally correspond to that of the dorsal vertebræ. Each rib articulates with two vertebræ—by its terminal portion or *head*, and with the transverse process of the lower vertebra by its *tubercle*. The ribs are divided into *true* and *false* ribs. The former are those which are joined to the *sternum* or breast-bone, the latter are those which are not so attached. In man there are seven upper true ribs, which are united to the breast-bone in front by cartilages—the *costal cartilages*. Of the remaining five lower or false ribs the upper three are each attached to the costal cartilage above, and not to the sternum; whilst the last two—eleventh and twelfth ribs—fall short of the cartilages, and terminate in free blunted points. The last two ribs in this way become popularly known, from their being unattached in front, as the 'floating ribs.' The number of true relative to the number of false ribs found in man—namely seven to five—is also an average proportion in most other mammals. The seals have many more true than false ribs; whilst of the whale-bone whales the reverse is true, but one pair of true ribs being found in certain forms. The actual number of ribs varies both above and below the number in man. Thus in certain cetaceans (*Hyperoodon*) only nine pairs of ribs are found, whilst in the two-toed sloths no less than twenty-four pairs are present. The ribs in man consist simply of two pieces, the rib proper, or *vertebral rib*, and the *costal cartilage* attaching the rib to the sternum. In some forms three parts may be demonstrable as composing the rib. This is the case in the lowest mammals (*Ornithorhynchus* and *Echidna*), in which a third and additional piece is placed between the sternal or costal cartilage and the rib proper or vertebral portion.

The conformation and comparative anatomy of the skull presents so many abstruse and technical points, that a few of the most general observations upon this head will suffice in the present instance. In mammals the *sutures*, or places of firm union between the bones of the skull, are, with the exception of the Monotremata, to be distinctly recognized in the fully-grown animal. In the Monotremata the sutures become obliterated by the firm osseous union of the bones, and this characteristic is common to these lowest mammals, with birds especially. The entire skull, and the bony skeleton of the trunk also, have been mapped out to form a series of complicated vertebræ—the vertebra or segment of the back-bone being thus taken as the type upon which the entire form is built up. Two condyles exist on the occipital or posterior bone of the skull, by which, as previously mentioned, the skull articulates with the atlas vertebra. In Birds and Reptiles only *one* occipital condyle exists; although in Amphibia (Frogs, &c.) two condyles are present. In these latter forms, however, the skull is of much lower structure than that of the Mammalia. The simple structure of the mammalian lower jaw or *mandible* is highly distinctive of the class when compared with that of Birds and Reptiles. In the latter classes, each half of the lower jaw is composed of a number of pieces, and the bone is thus of compound nature. In Birds and Reptiles the lower jaw is articulated to the skull by the interven-

tion of a separate bone—the *os quadratum* or *quadrate bone*. In mammals the lower jaw articulates directly, and of itself, with the skull, or *squamosal* part of the *temporal bone;* whilst the quadrate bone becomes the *malleus*, one of the auditory ossicles or bones of the internal ear. The jaws of mammals exhibit a division into various parts, corresponding with the actual and more apparent divisions of these bones in lower vertebrate forms. The upper jaw or *maxilla* consists of a front portion, the *premaxilla*, in which the *incisor* or front teeth are fixed, but which is more or less disguised in man; and of a hinder, and by far the larger portion, known simply as the *maxilla*. This latter part is also divisible into a complicated number of parts corresponding to its divisions in lower forms. All the other teeth are situated in the maxilla. The maxilla is much elongated in whales, and in such forms as the Great Ant-eaters. The halves of the mammalian upper jaw are generally united in the adult either by firm bony union or anchylosis, or by suture. In the Ornithorhynchus, however, and in certain bats, the premaxilla of one side is separated from the opposite premaxilla by a distinct interval. In the Echidna, on the other hand, the two premaxillæ are firmly united both above and below. And finally, in the Three-toed Sloths the two premaxillæ are firmly united together, but are separated in turn from the maxilla as it exists in man. The lower jaw in man is divisible into two halves or *rami*, united at the front by a *symphysis*. Each ramus has a *horizontal* and *ascending* portion, and terminates above in two processes, the front one being termed the *coronoid process* and the hinder the *condyle*. By the condyles the jaw articulates with the glenoid cavities in the temporal bones. Throughout the Mammalia the mandible may undergo alteration and change from its state and development in man. The ascending ramus of the lower jaw is less developed than in man; in *Rodentia*, as in the porcupines, it is low, and but faintly marked. In carnivores (for example, Dog) the coronoid process is greatly developed for muscular attachments, whilst in most rodents it is of rudimentary nature. Before birth the two halves of the lower jaw are separable, but at birth are united at the symphysis. In man and in a high ape (the Siamang Gibbon) alone does the symphysis project to form a true chin.

The limbs in mammals, like those of all other *Vertebrata*, are never more than four in number. The front limbs are invariably present, but in cetaceans and such allied forms as the dugongs and manatees the hinder limbs are unrepresented.

The *teeth* of mammals, as well as those of other vertebrate animals, are to be regarded as developments of the *dermis* or true skin. Each tooth consists of a *crown* or portion above the jaw, and of a *fang* or *fangs*, or, as they are popularly termed, *roots*, by which the tooth is secured in the jaw. The mode of formation and development of the teeth will be described in the article TEETH. Teeth are wanting in several mammals, and of imperfect structure in several orders of the group. Thus in the Echidna—a monotreme—in the Edentate Pangolins (*Manis*), and in the Ant-eaters (*Myrmecophaga*), teeth are absent entirely; whilst in the whalebone whales (*Balænidæ*), they are represented in the fœtal or embryonic state only, and become absorbed as development advances. In the Ornithorhynchus horny teeth of a rudimentary character are present; and in the order Edentata generally (for example, Sloths and Armadillos), the teeth exhibit an imperfection in structure, in that they are destitute of the enamel which forms so important an element in the conformation of the perfect teeth of other mammalian forms. The teeth of mammals are further lodged in *alveoli* or sockets, and are never, as a normal phase of structure, ossified to the jaw-bones as in lower forms. And in all mammals the teeth are situated upon the edges of the jaws only, and are not borne by any of the other bones which enter into the composition of the mouth. The sockets of those teeth which continue to grow throughout life are modified from the other and ordinary teeth; such modified sockets are seen in the tusks or incisor teeth of the elephants and in the incisor or cutting teeth of rodents, in which the roots are long and provided with a persistent pulp. The number of teeth varies greatly throughout the mammalian class. Man possesses thirty-two teeth in his permanent set, and the *Catarhine* or Old World monkeys agree with him in this respect, whilst the New World apes closely resemble his dentition save in some minor points. In the Priodon or large armadillo ninety teeth exist, and in the dolphins as many as 220 may be found. In the narwhal or sea-unicorn the opposite extreme is reached, where only two teeth are present. In form the teeth of mammals may vary very widely, as is best seen on comparing each kind of teeth with its representatives throughout the class. The differences in diet necessitate different forms of teeth, and we generally find the incisors, canines, and molars clearly defined in mammals; although occasionally, as in the dolphins, the teeth resemble each other so closely, that it is impossible to satisfactorily separate them or determine their true nature. The upper *incisor*, front, or cutting teeth are defined as those which are borne by the premaxilla. The *upper canine* is the tooth which is foremost in the maxilla, provided it be not at a considerable distance from the anterior end of that bone. The *lower canine* is the tooth biting in front of the upper canine. The *lower incisors* are those teeth situated in front of or in a line with the lower canine, or where the latter tooth is absent the lower incisors are those which correspond with the upper teeth of the same name. The *molar* teeth are divided into two sets, the *premolars* or *bicuspids*, and the *true molars*. The true molars are the only teeth of the permanent set not preceded by 'milk' or temporary teeth, and are hence defined to be teeth which are situated 'behind the hindmost tooth which has a vertical predecessor.' The premolar teeth —sometimes also called *false molars*, in contradistinction to the true molars—are defined as those situated 'behind the place of the canine teeth, and in front of the true molars.' Or in cases where the true molars are absent, the premolars are said to be those teeth behind the place of the canines and which have vertical predecessors; or in front of molars which have such predecessors. In describing the dentition or arrangement of the teeth in animal forms, but particularly in mammals, the naturalist is accustomed to use, for convenience' sake, an arrangement of symbols and numbers, to which the name of a *dental formula* is given. Thus the dental formula of the permanent teeth of man, who possesses two incisors, one canine, two premolars, and three molars in each side of each jaw, is given thus:—

$$\text{I}\ \tfrac{2-2}{2-2} : \text{C}\ \tfrac{1-1}{1-1} : \text{P.M.}\ \tfrac{2-2}{2-2} : \text{M}\ \tfrac{3-3}{3-3} = 32$$

The meaning of these symbols and figures will thus be evident. The *letters* stand for the names of the teeth. The figures *above* the horizontal lines express the teeth in the *upper* jaw, and those *below* the lines express the teeth in the *lower* jaw; whilst the upper and lower figures of each set are again divided to represent the teeth in each *half* of each jaw. Thus $\text{I}\ \tfrac{2-2}{2-2}$ simply reads that there are two incisor teeth in each half of the upper jaw and two in each half

of the lower jaw; and similarly with the other symbols in this and in other dental formulæ. In most mammals two sets of teeth occur as in man—a *milk*, *temporary*, or *deciduous* set, which is replaced at a sooner or later period by the second or *permanent* set. No mammal ever possesses more than *two* sets, although some forms have only one set throughout life. Such is the case in the dolphins, porpoises, and many of the edentate mammals in which a milk-set is wanting. Mammals with only one set of teeth are termed *monophyodont*, and those with the ordinary two sets *diphyodont* Mammalia. The teeth of the milk-set are not necessarily all replaced by permanent teeth. As we have already noticed, the true molars have no pre-existing representatives in the milk-set; but several other and wide variations may be observed in this respect throughout the class. Thus in the Marsupialia the only tooth preceded by a temporary one is the tooth corresponding typically to the fourth premolar. The permanent canines of man are developed before the last true molars or 'wisdom teeth;' but in the higher apes the canines appear after the true molars are developed. In the guinea-pigs the milk-teeth are shed whilst the animal is still *in utero;* and on the other hand the Ungulata generally retain their milk-teeth until adult age is reached—these instances exemplifying extreme types of variation in the succession of the sets of teeth. And from the form, number, and disposition of the teeth valuable characters in the classification of the Mammalia and in the distinction of genera are drawn. The chief peculiarities in dentition will be noted in the consideration of the mammalian orders. Man and a lemur (*Tarsius*) are the only mammalian forms in which the teeth are placed in a continuous series, and are unseparated by any *diastema* or interval. Generally in higher mammals (for example, apes), we find interspaces to exist between certain of the teeth, as between the canines and first premolars of the lower jaw, and between the canines and outer incisors of the upper jaw; this arrangement being for the purpose of accommodating the large pointed crowns of the canines in the movements and in the closure of the jaws.

Little need be said in the present instance regarding the internal anatomy and viscera of Mammalia. The chest or thorax in all mammals is separated from the abdominal cavity by a complete *diaphragm* or 'midriff,' which thus constitutes a great muscular partition between these cavities, and also forms the most important agent in effecting the movements of the chest during respiration. Within the thorax the heart and lungs are contained; whilst the abdomen and its lesser pelvic cavity contain the organs relating generally to digestion, excretion, and reproduction (for example, stomach, intestines, liver, pancreas, spleen, kidneys, and generative organs). With the exception of cetaceans all mammals possess salivary glands, and in some cases (for example, ant-eaters) certain of these glands undergo enormous development. In the dolphins the tongue is non-protrusible, and constitutes the floor of the mouth as it were. In the elephant it is incapable of being freely moved about, and in the manatees it is of small size, and fixed to the floor of the mouth. In the seals the tongue is bifid at the point, and in the Greenland whale it is fixed to the mouth by the sides, and is free at the point only. In the pangolin it attains its greatest length among mammals, and in the Tamandua Ant-eater, &c., it is provided with recurved spines. The stomach, generally simple, may, as in some monkeys, in the kangaroos, in the pig, and most of all in the ruminants, exhibit a division into compartments. In the Great Ant-eater a structure resembling the gizzard of birds is developed. A liver and pancreas are present in all Mammalia. The lungs agree in essential structure with those of man, as also does the heart with its four chambers—right and left auricles and right and left ventricles. The right side of the heart, as in birds, is *venous*, that is, is exclusively occupied in sending the venous blood to the lungs to be purified. The left side is as exclusively *arterial*, and sends the purified or arterial blood from the lungs through the system. The red corpuscles of the blood are *non-nucleated*, that is, do not each possess a little central particle or nucleus, as is the case with all vertebrates below mammals. The red-blood corpuscles are elliptical or oval in shape in the Camelidæ or Camels; in all other mammals they are circular. The musk-deer possesses the smallest red blood corpuscles known, these latter being only about $\frac{1}{1818}$th of an inch in diameter. The red corpuscles of man average $\frac{1}{3200}$th of an inch in diameter. The kidneys of mammals lie in the *lumbar* region or that of the loins. The *Wolffian bodies* or *primordial kidneys* of the embryo mammal are replaced by the true kidneys, which are developed before birth. The reproductive organs vary exceedingly in their conformation throughout the mammalian class; and, as will be afterwards noticed, one system of mammalian classification has been founded on the structure of the reproductive organs; so definite characters and differences do these structures afford and exhibit. All female Mammalia possess two *ovaries*, and the mammalian *oviducts* are known as *Fallopian tubes*. The simplest condition of the internal reproductive organs is seen in the monotrematous and marsupial mammals, in which each Fallopian tube dilates into a cavity—the *uterus* or womb—which opens either into a *vagina* or passage leading from the external to the internal generative organs as in the kangaroos; or into a *cloaca*, as in Ornithorhynchus. These mammals thus possess two distinct uteri or wombs, and therefore are, broadly speaking, known as *didelphous* (Greek, *dis*, two; *delphus*, womb) Mammalia. In all the other and remaining orders of Mammalia—save in the Quadrumana and in man—the two uterine cavities unite inferiorly in the adult, and thus open into the vagina by a single opening, although their superior or upper extremities are ununited, and divided into the horns or *cornua* of the uteri. In man and in the higher monkeys the two uteri are still more completely united than in the majority of higher mammals; for in man and most Quadrumana there are no cornua, and the uteri unite completely both above and below so as to form a single uterus and uterine cavity, opening, as in the previous case, by a single opening into the vagina. The Fallopian tubes of man and the Quadrumana, in turn, open into the upper part or *fundus* of the single uterus. Man, and all other mammals, excepting the monotremes and marsupials, are therefore known as *monodelphous* (Greek, *monos*, single) Mammalia. The males in this class possess two *testes*, corresponding to the female ovaries. In the elephants, Cetaceans, Monotremata, and some Edentates, the testes are retained permanently in the abdominal cavity; whilst in others (for example, bats, hedgehogs, some rodents, &c.) they descend partially from the abdomen, especially at the breeding seasons. In others and in the highest mammals the testes pass at an early period of life from the abdomen into an integumentary pouch known as the *scrotum*, which is generally placed behind the *penis* or intromittent organ; but occasionally, as in the Marsupialia, the scrotum is situated before the penis. The *mammary* or *milk glands* form the last structures of interest in the general consideration of mammalian characteristics. The minute and intimate structure of these glands is described in the article MAMMARY GLAND. These glands are regarded as extreme modifications of the

ordinary sebaceous glands of the skin. All mammals possess these glands, which, however, may differ chiefly in number and position throughout the class. In male mammals the glands are represented, but are—unless under pathological or abnormal conditions—functionally useless. These glands are placed on the ventral or lower surface of the body, and may vary greatly in their exact position on this surface. When placed on the breast, as in man and apes, the mammæ are termed 'pectoral;' when further back and on the abdominal surface they are called 'ventral' or 'abdominal.' In number these glands vary from two, as in man, to twenty-two, as in the tanrecs, belonging to the Insectivora. The hedgehog and sow possess each ten mammary glands. The number two is not, however, limited to man and the Quadrumana, for the Cetacea possess two glands situated at the hinder extremity of the body; whilst in the dugongs and manatees (*Sirenia*), and in elephants and sloths, there are but two mammæ, situated, as in man, on the breast. In Ruminantia the glands are united to form the udder, upon the surface of which the teats open. In some lemurs (for example, the Aye-aye) nearly allied to the apes the mammæ are placed in the groin (*inguinal*), and are two in number; in other lemurs (for example, *Tarsius*) a pair of inguinal and a pair of pectoral mammæ exist; and in Galago, another lemur, there are four glands, situated on the breast. The mammary glands of the Monotremata have no nipples, the ducts opening upon the surfaces of the glands, which are not elevated to form teats. In the allied order Marsupialia (kangaroos, &c.) the teats are greatly elongated, and in the latter forms, the mammæ and teats are contained within the characteristic *marsupium* or pouch. In both monotremes and marsupials the mammary glands can be compressed at the will of the parent by special muscles, which force the milk into the mouths of the attached and helpless young. The nipples in some opossums form an odd number; but there is never a single nipple only. In the kangaroos four nipples exist; in other Marsupialia eight are found, and in some opossums nine, eleven, and thirteen respectively exist. In the Echidna, one of the Monotremata, the skin around the nipples is depressed to form a kind of shallow pouch, whilst the gland is functionally active. In man from fifteen to twenty milk or *laticiferous* ducts open on the surface of each nipple; and in Sirenia, Marsupialia, elephants, and highest apes, the ducts opening in each teat are similarly numerous. But in some forms (for example, Cetacea, pigs, Ruminantia) a single duct only opens in each teat. In horses and apes generally, two ducts open in each nipple; whilst five or six are found in each teat of some rodents and carnivorous Mammalia.

The *classification* of this large and important group has been variously attempted at different times and by different authorities. A familiar, and at the same time a classification of modern kind, was that of Owen, which divided the class Mammalia into two primary sections or divisions, accordingly as the structure known by the name of the *placenta* (which see) was present or not in the development of the young. This placenta, or 'after-birth,' as it is familiarly designated, is the structure through which the blood of the mother is conveyed to the fœtus or embryo; and all mammals, in the development of which a placenta was formed, were termed *Placentalia*, or *placental* mammals. Those in the development of which such a structure was ascertained to be absent, were, on the contrary, known as *Implacentalia*, or *non-placental* mammals; and in this latter group only two orders, the Monotremata and Marsupialia, were included. The placental or higher mammals thus included all mammals other than these two orders, and therefore by far the greater number of mammals.

The *orders* which are included at the present time in the class Mammalia have not so much undergone alteration in constitution and arrangement as the *characters* which have been selected for their separation and distinctions, or as the *primary divisions* of the class; and even at the present time the constitution of the last-mentioned groups or sub-classes is still argued according to different systems and modes of arrangement. Thus we have still extant the separation of the mammals into Placentals and Implacentals. Then, secondly, the class is also primarily subdivided by Owen into four main groups—the *Lyencephala* (Marsupials and Monotremes); the *Lissencephala* (Edentates, Insectivores, Rodents, and Bats); the *Gyrencephala* (Monkeys, Ungulates, Elephants, Carnivores, Cetaceans, and Sirenia); and the *Archencephala* (man);—the structure and relative perfection of the brain being taken as the basis of this arrangement. Several important points in this latter classification, it may be remarked, have been strenuously opposed as incorrect by some eminent authorities; and it will be seen from a glance at the forms included in each primary division that this system has the effect of classifying together orders, which from other points of view, and in other systems, are very widely separated. Edentates, Rodents, and Bats are thus brought together in Owen's cerebral classification—orders which, under other arrangements, and in all points, save the brain-structure, are widely separable. The nature of the reproductive organs was taken by De Blainville in 1816 as the basis of his classification of the mammals, and in the present day this system of arrangement has been largely adopted. The three primary divisions of Mammalia, according to De Blainville, are the *Ornithodelphia*, *Didelphia*, and *Monodelphia*. The meanings of the two latter terms have already been explained in treating of the mammalian reproductive organs; the former term is applied to the monotremata, from the *bird-like* disposition of the female generative organs, the two uteri being distinct and separate throughout their entire extent, and opening, not into a vagina or genital passage (as in the Didelphia), but directly into a chamber known as the cloaca, which also receives the contents of the ureters and the rectum. This condition essentially resembles the arrangement of parts in birds, and hence the origin of the term Ornithodelphia (*G. ornithos*, a bird; *delphus*, womb). The Monotremata form the only order included in this primary and lowest division of the class. The second sub-class of De Blainville, the Didelphia or 'double-wombed' mammalia, likewise includes a single order only, that of the Marsupialia or kangaroos, opossums, &c. And these forms possess, as already remarked, two uteri, which open each into a distinct vagina; the latter passages opening, in turn, into a *urogenital canal*. This canal thus receives the ducts of the genital organs, and also those of the urinary apparatus; but the rectum terminates by a separate aperture, and in this latter respect the Didelphia differ from the preceding division. The Monodelphia, or 'single-wombed' mammals, as already noticed, possess a single uterus only, and this structure opens into a single vagina, which is entirely separated from the rectum. Man, and all mammals other than the monotremes and marsupials, belong to this higher section of the class. The Implacental section of Owen thus corresponds to De Blainville's Ornithodelphia and Didelphia; whilst the Placentalia agree with the higher section of the latter zoologist—that of the Monodelphia.

A brief enumeration of the chief orders and ordinal characters of the mammalia may fitly conclude the general consideration of the class—the more special characters of the various mammalian groups being

discussed in separate articles, under the headings of the respective orders.

1. The *Monotremata* (G. *monos*, single; *trema*, opening) form the lowest order of the class. The group includes two genera only, the *Ornithorhynchus* (of which but a single species, *O. paradoxus*, is known), or Duck-billed Water-mole of Australia; and the *Echidnas*, or Porcupine Ant-eaters of the same province. These are the Ornithodelphous Mammalia. The characters of the reproductive organs in these forms have been already noticed. The testes of the male are not lodged in a scrotum, but are abdominal throughout life. The two mammary glands are abdominal, and are destitute of teats. There is no placenta. The so-called 'marsupial bones' are present, but are never associated with a 'marsupium,' or pouch, as in the next order.

2. The *Marsupialia* (L. *marsupium*, a pouch) form the Didelphous mammals, and constitute the second order of the class. They are represented by the Kangaroos, Opossums, Wombats, Phalangers, Bandicoots, Tasmanian Wolf, &c. &c. The didelphous characters have already been noted. The testes are lodged in a scrotum, which is remarkable for being situated in front of, and not behind, the penis. Marsupial bones are present, and in the females mostly support a marsupium or pouch, in which the immature young are lodged and protected. The nipples project into the pouch. These forms are implacental, like the Monotremata.

3. The *Edentata* (Latin *e*, without; *dens*, a tooth) are represented by the Sloths, Armadillos, True Ant-eaters, Pangolins, &c. These forms are primarily distinguished by the rudimentary nature of the teeth, these organs being destitute of enamel, not forming roots, and being rarely replaced by a second set. Though not absolutely *toothless*, as the name Edentate would lead one to believe—only two genera wholly want teeth—the middle incisors are invariably wanting; and in only one species (an armadillo) are any incisors present. Canines are generally absent, and sometimes molars are also wanting. The toes are clawed. Mammary glands are borne upon the chest, and sometimes abdominal or inguinal glands are present. The Edentates and all succeeding orders are placental mammals. In the Edentata the placenta may either be *deciduate* or *non-deciduate*—these latter terms having reference to the amount of the maternal or placental tissues which are thrown off at birth. Thus, where a placenta is deciduate, the entire structure, representing a large amount of maternal vascular tissues, is thrown off. Where it is non-deciduate, no such extrusion of embryonic and maternal structures takes place at birth.

4. The *Cetacea* (Whales, Dolphins, Porpoises, Narwhals) are aquatic Mammalia, having no hind-limbs or sacrum, and possessing a horizontal tail-fin. The fore-limbs exist as swimming paddles, and are destitute of nails. A dorsal fin or expansion of the skin sometimes exists. The nostrils are situated on the top of the head, and may be single or double. There are two mammæ, and these are inguinal in position. Hairs are, at the most part sparsely developed. One set of teeth only is developed, and teeth may, in the adults, be wholly wanting. A non-deciduate placenta.

5. The *Sirenia*, including the Manatees or Sea-cows and Dugongs, are sometimes classified as a section of the Cetacean order. They are also aquatic forms, and possess a horizontal tail-fin. In the disposition of their limbs the Sirenia also agree with the preceding group. Teeth are developed, however, in the Sirenia, two sets being present. The nostrils are always separate, and are placed on the upper aspect of the snout. Hairs are scantily distributed over the body surface. The swimming paddles bear rudimentary nails. There is never a dorsal fin. The mammæ are two in number, and are pectoral—that is, are situated on the chest. Placentation unknown.

6. The *Ungulata* or 'Hoofed' Quadrupeds form a very large group, which comprises no less than three orders of the former system of classification. The *Ruminantia*, the *Solidungula* (or Horses), and the *Pachydermata* or *thick-skinned* mammals (Rhinoceroses, &c.), are thus included under the single order Ungulata, but are parcelled out to form subdivisions of this large group. The chief characters of this compound *Ungulate* order are embraced in the facts, firstly, that there are never *more* than four fully-developed toes to each limb; and the terminal phalanges are encased in thick nails, largely developed to form *hoofs*. Clavicles are wanting. The teats may be inguinal in position and few in number, or abdominal when they are numerous. The placenta is non-deciduate.

7. The *Hyracoidea*—represented by the single genus, *Hyrax*, one species of which is the *coney* of Scripture—form a small order, constituted to receive these forms, which, from several anomalous features, could not satisfactorily be classified with any of the other orders. In some systems of arrangement the *Hyracoidea* are included in the Ungulata, and are classified with the Rhinoceroses. The distinctive features of these forms, as an order, are found in the absence of canine teeth, and in the possession of elongated curved upper incisor teeth, which grow from permanent pulps like those of the Rodentia. The lower incisors are straight, and grooved in a longitudinal manner. There are no clavicles. There are four toes on the front, and three on the hind feet. The placenta is deciduate. There are four inguinal teats, and two situated in the axillæ or armpits.

8. The *Proboscidea* include the Elephants only. This order was separated from the Ungulate group—the Elephants being formerly included in the Pachydermatous division—from the possession of very distinct characters, seen chiefly in the possession of molar and upper incisor teeth only: the latter growing from persistent pulps, and constituting the well-known 'tusks.' Clavicles are wanting. The feet are provided each with five toes. The mammary glands number two, and are situated between the fore-legs. The nose is prolonged to form a muscular proboscis. Hairs are scanty. Placenta deciduate.

9. The *Carnivora* or Flesh-eating mammals, comprising very many families (Lions, Tigers, Cats, Dogs, Seals, Bears, Walruses, &c.), are characterized by the presence of the three kinds of teeth, of which the canines are large and the molars have sharp or trenchant edges. The clavicles are rudimentary. Nails developed to form claws. Teats never fewer than four, and placed abdominally. Placentation deciduate.

10. The *Rodentia* (Rats, Mice, Beaver, Porcupines, Rabbits, Hares, Squirrels, &c.) are distinguished by the want of canine teeth, and by the presence of only two incisors in the lower, and generally two—but sometimes four—in the upper jaw. The incisors grow from persistent pulps, and grow throughout life. Teats generally numerous. Placentation deciduate.

11. The *Cheiroptera* or Bats, possess the four fingers of the hand greatly elongated to support a *patagium* or 'flying-membrane,' which extends along the sides of the body uniting the fore and hind limbs of each side, and frequently the hind-limbs and tail. By aid of this membrane the Bats can support themselves in the air. The hind-limbs are short, and have their digits invariably of a normal and usual

length. Clavicles are developed. The thumbs of the fore-limbs are of normal size. The teats are pectoral, and number two or four. Canine teeth are always present. Placentation deciduate.

12. The *Insectivora*, comprising the Moles, Hedgehogs, and Shrew-mice, have the molar teeth provided with sharp cusps adapted for crushing the insect diet. Generally more than four incisors are present in each jaw. Well developed clavicles are present in the great majority of Insectivora. The placentation is deciduate. The Flying Lemurs (*Galeopithecus*) are by some authorities included in this group.

13. The *Primates* include the orders Quadrumana (Monkeys) and Bimana (Man) of some systems of classification. To include both in one order appears the course most consistent with the structural relations of both series of forms; the *anatomical* differences—which are alone expressed in a zoological classification—being susceptible of expression through the subdivisions of the single and compound order. Linnæus first constituted the division Primates, which is distinguished as a whole by possessing never more than four upper and four lower incisors. The hallux or great toe has generally a flat nail, and can be abducted or adducted in a greater or less degree. Well developed clavicles always exist. The divisions of this order include:—

(*a.*) The *Anthropidæ* (*Bimana*), represented by man, in whom the teeth form an uninterrupted series. The thumb or pollex can be opposed to the other digits; but the great toe or hallux is nearly as long as the second toe, and is incapable of opposition. The erect position is maintained. The arms are shorter than the legs; the lower limbs growing faster after birth than the upper members, or the rest of the body. The mammæ are two in number, and are placed on the breast.

(*b.*) The *Simiadæ* include the apes and monkeys, or higher Quadrumana, in which the teeth are uneven and interrupted by a *diastema* or interval. The great toe is much shorter than the second toe, and can be abducted or adducted with freedom. The arms may be longer or shorter than the lower limbs; the latter, however, do not grow in the same proportion to the rest of the body as in man. The mammary glands are pectoral, and number two.

(*c.*) The *Lemuridæ* or Lemurs comprise the lower Quadrumana, in which the teeth are arranged, in the majority of instances, as in the Apes. The great toe is of large size; the second toe being small or rudimentary. The teats may number more than two. The placentation of the primates is deciduate. The features, structural and mental, which separate man from the Quadrumana will be discussed under the article MAN; and for detailed information regarding the various mammalian orders, the reader is referred to the articles descriptive of the orders (for example, QUADRUMANA, RODENTIA, &c.); and also to the articles descriptive of the leading genera of each order, which latter are given under their familiar headings, such as LION, TIGER, LEOPARD, &c.

MAMMARY GLANDS, the glands characteristic of the highest group of living forms—the class Mammalia. These structures are to be regarded as peculiar developments of the skin or cutaneous glands, and present in man an essentially *lobular* structure. They thus bear a resemblance in essential structure to the pancreas and salivary glands. The lobes are divisible into smaller *lobules*, and these latter are in turn seen to be made up of *sacculi*, or the pouch-like extremities of certain ducts which are lined by peculiar epithelial cells, known as *glandular* or *spheroidal epithelium*. The lobules and the larger lobes which they tend to form, are united together by areolar or fibrous tissue; and the whole structure of the gland is invested and covered by a layer of yellow fat, which sends processes between the lobules, and constitutes a considerable portion of the bulk of the gland. This fatty layer is itself circumscribed, and divided into lobes by bands of the areolar tissue which unites the lobules; and the latter tissue unites with the investing skin of the gland above, and attaches the gland below to the *pectoralis major* or great muscle of the breast, on which it rests. The lower surface of the gland is flattened, and is loosely connected to the great muscle below. The sacculi or follicles of which the ultimate lobules consist, and in which the minuter ducts of the gland take origin, are abundantly supplied with minute blood-vessels; and from the blood thus brought to the intimate structure of the gland the epithelial cells of the sacculi secrete the milk. The smaller ducts from the lobules unite to form the larger ducts of the lobes; and these latter, known as the *lactiferous* or *galactophorous ducts*, from fifteen to twenty in number, open on the surface of the nipple, each by a distinct orifice. Before terminating in the nipple each duct dilates to form a reservoir-like sac or receptacle, averaging from 2 to 3 lines in width. These receptacles contain and store up the milk, secreted by the gland during its periods of functional activity, until the secretion is required. The walls of the milk-ducts themselves are composed of fibrous and elastic tissue; and internally they are lined by a delicate mucous membrane, and by the layer of epithelial or secreting cells previously described. The *nipple* of the breast, or *mammilla*, as it is termed, is situated a little below the centre of the gland. It is surrounded by a disc or circle of darker coloured skin known as the *areola*. In women who have not borne children this areola is of a light-pink colour; but in the pregnant state it passes through a series of changes so characteristic, that obstetricians have come to regard the areolar signs of pregnancy as among the most important indications of that condition. It grows darker and enlarges after the second or third month of gestation; and at the end of the pregnant state becomes very dark in colour, whilst the papillæ and sebaceous glands which it contains also become very prominent. In women who have borne children the areola is of a dark-brown colour. The subcutaneous glands of the areola lubricate the surface of the gland and nipple during the period of lactation. The nipple itself is composed of unstriped muscular fibres and areolar tissue. It also possesses erectile powers, and blood-vessels are in consequence freely distributed to it, whilst its summit is provided with papillæ exercising a highly sensitive function. The breasts receive their blood-supply from the *long thoracic* and *internal mammary arteries;* and the nerves of the breast arise from the anterior and lateral branches (*cutaneous*) of the *intercostal nerves*. Lymphatic vessels and glands also enter into the structure of the breast; and these latter, as well as the blood-vessels, are subject to great modifications when the functions of the mammary glands are in full operation. For the differences in conformation of these glands in various mammals see the article MAMMALIA.

MAMMEE-TREE, or WEST INDIA APRICOT (*Mammea Americana*), a large and beautiful tree, native of tropical America, and interesting from the qualities of the fruit, which is highly esteemed. This fruit is large, roundish, and contains a bright yellow, firm pulp, which is enveloped with a thick leathery rind; within this outer rind is a second very delicate one, closely adhering to the pulp, which should be cautiously removed, otherwise it leaves a bitter taste in the mouth, not very strong at first, but gradually increasing, and continuing for two or three days. The taste is peculiar, sweet, and very agreeable,

and is accompanied with an aromatic, pleasant odour. The tree belongs to the natural order Guttiferæ, and attains the height of 60 or 70 feet. The leaves are oval, obtuse, very entire, smooth, and 6 or 8 inches in length. The flowers are white, 1½ inch in diameter, and diffuse a delightful perfume.

MAMMON, the Syrian god of riches, mentioned in Scripture by our Saviour as a personification of worldliness.

MAMMOTH (Russian, *momot*), a species of extinct elephant, the fossil remains of which are found in European, Asiatic, and North American formations. It was specifically distinct from the existing species of elephants, and must have greatly exceeded them in size. Geologically speaking, the mammoth, or *Elephas primigenius*, as it was scientifically named by Blumenbach, dates from the post-pliocene period. It certainly survived the extreme cold of the glacial epoch, and persisted to the post-glacial period, since its remains occur in post-glacial deposits in Europe, Asia, and North America. And the mammoth becomes additionally interesting when we find that it unquestionably survived the beginning of the human epoch, and thus became an early contemporary of primitive man. Mammoth remains have been found in intimate association with the handiwork of savage man; and upon a piece of bone a rude portrait of this animal was found scratched—this latter incident going far to prove the fact that primitive man had seen the object he had thus endeavoured rudely to decipher. The molar teeth of the mammoth are broader than those of existing elephants, and possess the transverse ridges more closely set than in the teeth of existing species. The teeth of the Indian elephant most nearly resemble those of the mammoth. The tusks in the latter form appear to have been more widely curved than in other or in living elephants; and several specimens have shown that the tusks must have attained an immense size. One specimen found in tertiary deposits in Essex 'measured 9 feet 10 inches along the outer, and 2 feet 5 inches in circumference at its thickest part; another from Eschscholtz Bay was 9 feet 2 inches in length and 2 feet 1½ inches in circumference, and weighed 160 lbs.' (Owen). A mammothian tusk which was dredged off Dungeness was found to measure 11 feet in length. So plentifully do mammoth remains occur in the icy drift of Siberia and Russian America, that the tusks have long been sought after in these regions, and obtained in sufficient plenty to form a source of commercial supply for ivory. In one particular instance, during last century, an almost entire specimen of the mammoth was found imbedded and preserved in ice near the mouth of the Siberian river Lena. This specimen was known to the natives long before its discovery by an English traveller named Adams. Its skin was perfectly preserved, and was seen to be clothed with a furry wool of reddish colour, which was interspersed with black hairs. It measured 16 feet 4 inches from the forehead to the extremity of the mutilated tail; its height was 9 feet 4 inches; and the tusks, along the outer or greater curve, measured 9 feet 6 inches. The skeleton and other parts of this particular form are preserved in the St. Petersburg Royal Museum. In other cases so perfectly were the most delicate tissues preserved, that the microscopic structure of even the eyes could be examined. The mammoth thus differed from all existing elephants in being fitted to exist in a cold and rigorous climate, and in having its structure adapted to meet the exigencies of such an existence. It subsisted apparently on the foliage of northern trees, such as the birches and pines, and during the summer migrated in all probability northwards, returning to its southern limit as the colder winter approached. Its geographical range, as already remarked, must also have been very great. In North America it was contemporaneous with the Mastodon (which see), another gigantic elephantine form, not to be confused with the mammoth. (Pl. LXXXVI. fig. 57.)

MAMMOTH CAVE, a stupendous cave in Kentucky, near Green River, 130 miles s.s.w. of Lexington. It has been penetrated 9 or 10 miles, and has many windings that have not been explored. The height of the roof is generally 60 or 70 feet. It is more remarkable for its extent than the variety or beauty of its productions, the stalactites, though of immense size and fantastic form, having none of the brilliancy and beauty of those that adorn many other caves. The earth is strongly impregnated with saltpetre. A river, navigable by boats, affords a means of exploring these subterranean recesses. Two varieties of fish have been found in it, one of them eyeless, the other with eyes but blind. Bats, rats, and several species of insects are abundant in the cave.

MAN. The special structure of man's body having been treated under the article ANATOMY, and the different varieties of the human species and their distribution under the subject of ETHNOLOGY, the present article may fitly be devoted to the consideration of the structural and other points by which man is distinguished from the lower animals, and more immediately from the higher Quadrumana or Apes. In view of recent speculations regarding his origin and descent, the zoological position of man becomes a question of great import, not only to the naturalist, but to the ordinary, non-technical, and intelligent reader. And a correct appreciation of man's structural relations to the higher Quadrumana will be found to constitute the surest guide in the effort to arrive at some satisfactory solution of the great question which is agitating other than purely scientific circles. The various systems of classification of the higher mammals which from time to time have been constructed differ much in the expression of man's relations to the higher Apes, in so far at least as these relations are expressible by a reference to classification and arrangement. The simplest of all modes, expressing a vast gap between the Quadrumana and man, classifies man in the order Bimana ('two-handed'), the highest division of the Mammalian class; and relegates the Monkeys and Apes to the lower and distinct order—that of the Quadrumana ('four-handed'). A more recent arrangement classifies man and the monkeys, apes and lemurs (= Quadrumana) in one order, to which the distinctive name of Primates is given; and this order is divisible into three subordinate groups, of which the *Lemuridæ* and *Simiadæ* include the Lemurs and Monkeys, whilst the third and highest group, the *Anthropidæ*, includes Man alone. Here again, so far as can be expressed by a system of classification, the relations of man to the Quadrumana are viewed as of a more intimate kind than in the first-mentioned arrangement. From the purely anatomical point of view most naturalists would be inclined to adopt the latter classification; but the subject is one which admits of being regarded, and even demands notice, in a second and equally important aspect to its purely structural phase. The mental or psychical endowments of man constitute tests for estimating his position, by which we are obliged to remove him far above the highest Quadrumana; and a system of classification founded upon the characteristics of man's mind would separate him from all other Primates, by as wide an interval as the Primates themselves are separable from the lowest created forms. So widely dissimilar, in short, are the results which anatomical and psychical science respectively arrive at in considering man's place in nature, that no comparison

can be made between them; and in effect the zoologist and psychologist must each be content to consider man from two entirely distinct points of view, or in two modes of discussion, which, like parallel lines, may run side by side, but may never meet.

Man's position, as head at once of the vertebrate series and of the animal kingdom, does not at all invalidate his agreeing with other vertebrates in all characters which are essential and common to the great sub-kingdom Vertebrata. (See INVERTEBRATA and VERTEBRATA.) The characters distinctive of man himself, and by which he is anatomically separated from the highest Apes, form, however, a very distinct and appreciable series. But at the same time it should be clearly borne in mind, that the total expression of the purely *anatomical* differences between man and the highest Quadrumana does not evince a great or striking result. As a vertebrate nearly allied to the Quadrumana, and partaking of a close typical structure with the Apes, the mere structural differences do not, in the aggregate, amount to so great an extent as the popular reader might be naturally inclined to suppose. Only, as already remarked, from a psychological stand-point can the infinite and absolute differences between man and the higher animals be plainly seen. Differences of structure in this case, so far from being absolute, are simply relative, and that to a very minor degree. Whether viewing man as the highest of the Primates, or as the sole representative of the Bimanous order, we find his first grand characteristic in the *erect position*, which he of all animals is alone competent to assume. This position, necessitating corresponding adaptations of anatomical structure to be presently alluded to, has long been dwelt upon and noted by poets and philosophers as a grand characteristic of the human form. No ape assumes the erect position in its fullest sense, and such as do occasionally assume this posture can only partially imitate man, and that in an awkward manner, and for a very short period of time. The form of man's pelvic bones and the curves of his spine exhibit an obvious adaptation to the erect posture. The pelvis itself is shortened and strong; its width is greater than its depth. The sacrum is also peculiarly broad. The articulations of the thigh-bones are in consequence placed widely apart, and thus give a substantial base from their broadened and separated position. The Quadrumanous pelvis is elongated and narrow, the sacrum is longer than in man, and the pelvis is found to lie in nearly the same plane or axis as the spine. In apes also the height of the pelvis is greater than its breadth. The thigh-bones in the Apes rest in an oblique position when the body is erect, the body being tilted in front; and these bones thus make an oblique angle with the pelvis—an angle found much more acute as we descend lower in the Mammalian scale. The femur in man is of greater relative length than in any other animal, and lies in nearly the same line with the axis of the trunk. The spine itself shows a series of curves well adapted for the preservation and natural assumption of the erect position. The human skull also exhibits manifest adaptations to the erect position. A line passing through the centre of gravity of the skull would pass just between the two occipital condyles or articular processes by which the head is joined to the spine. The shorter hinder portion of the skull is occupied by dense brain matter, the weight of which counterbalances the front and longer portion of the cranium, including the face. The *foramen magnum*, or large aperture in the base of the skull, through which the brain becomes continued into the spinal cord, is situated a little posteriorly to the centre of the base of the cranium, and its plane lies in a horizontal position when the head is braced upwards. The effect of this arrangement is thus to lodge in man a considerable portion of the brain behind the occipital condyles: whilst in other mammals a comparatively small portion of brain—or scarcely any in proportion to the mass in front of the condyles—lies posteriorly to these articular processes. The bones of the face in man do not project forwards, whilst they are elongated in a downward direction; and the face and forehead are situated nearly in the same plane, so that the face immediately underlies the brain. If we compare the skull of the higher Apes we at once note the fact that the bones of the face in these forms project forwards, and the brain lies posteriorly to the face. Similarly the development of a distinct chin is also a peculiarly human feature, and one which in the highest varieties of mankind becomes most marked. The shortening of the face admirably shows man's consistent adaptation to the erect posture; whilst conversely the elongation of the muzzle and the oblique portion of the condyles in the Apes gives them a natural facility for observation in the horizontal posture, and for a partially erect position also; the latter posture being that in which these animals rest upon the front limbs, with the head thrown forwards on its oblique articulation. The great *cranial* capacity of man, or the greater size of the cranial or brain portion as compared with the facial portion of the skull, forms another noteworthy and distinctive character of the human form. This character was embodied by Camper, a Dutch naturalist, in his *facial angle*. (See FACE.) The results obtained by the application of Camper's system of measurement must be taken rather in a relative and approximate, than in an absolute sense; since the amount of elongation of the jaws greatly determines the size of the angle, and this in great measure apart from the capacity of the cranium and elevation of the forehead. Camper's angle may thus be taken only as a guide to indicate the excess or diminution of the facial over the cranial skeleton. The human skull is notable as presenting us with a marked absence of the strong bony ridges and crests serving for the attachment of muscles, which are so highly developed in the higher Apes and in carnivorous mammals generally. The jaws of man are proportionally small when compared with the size of the cranium, and the marked elongation of the jaws of other mammals has been already referred to in alluding to the elongation downwards of the face. In the lowest types of man the jaws are never so prominent as they are in the highest Apes. The teeth of man are arranged in a continuous series, and without any *diastema* or interval; and this feature is curiously enough found also and solely in a little lemur—*Tarsius*—which is not at all or nearly allied to man, save in general Quadrumanous structure. The canines in man are of small size, and not, as in the Apes, separated from adjoining teeth by an interval. The arms of man are much shorter than the legs, and are used solely for prehension. The thumb is strong and of greater relative length than in other mammals, reaching to the middle of the proximal or basal joint of the fore or index finger. In respect of its size and length, and the power of perfectly opposing itself to the other fingers singly or in combination, the human thumb possesses a marked advantage and superiority over those apes which approach most nearly to the human type of structure. The hand of the highest ape is but a clumsy—if we may use this expression—imitation of the hand of man, and is only available for grasping objects of considerable size. Sir Charles Bell's remark is therefore perfectly justifiable, 'We ought to define the hand as belonging exclusively to man.' In other respects, as in the freedom of motion

of the upper extremities, and in the movements of prehension, rotation and supination, the anterior limbs of the Apes resemble those of man. The lower limbs of man, devoted solely to locomotion, exhibit marked differences from the corresponding members in all other mammals. In man the lower limbs are relatively longer than in most other mammals, and the segment of the limb which exhibits the greatest relative length is the thigh. In man, therefore, the arms reach only to the middle of the thigh, whilst in the higher Apes they extend to the knees or even to the ankles. The human foot, no less than the human hand, is characteristic of man. Man is distinctly *plantigrade*, that is, walks on the whole sole of his foot. The great-toe is not adapted for prehension, and is thus unopposable to the other digits. The foot itself is doubly arched, from side to side, as well as from behind forwards—a conformation giving to the human step its well-known elasticity. The plane of the human foot lies at right angles to the leg. The weight of the body falls upon the arch, supported by the heel-bone behind and by the metatarsal bones in front. The placing of the heel firmly upon the ground is natural to man only; the heel in the higher Apes touches the ground only partially; and in lower mammals the heel is generally raised off the ground; the animals being *digitigrade*, that is, walking more or less upon the tips of the toes. In the Apes the foot becomes more or less modified to form a prehensile organ; the great-toe is capable of extensive movement, and the animals thus become 'quadrumanous' in the truest sense of the term.

The muscular arrangements of the human trunk and limbs exhibit features highly characteristic of man's structure and economy. The *glutæi*, or hip-muscles, arising from the broad and expanded ilia or pelvic bones, thus keep the trunk erect and fixed upon the thigh-bones, and are of larger size than in other mammals. The muscles (*extensors*) which extend the legs upon the thighs are more powerful than the opposing or *flexor* muscles; and the muscles of the 'calf,' which keep the leg straight or erect upon the foot, are more largely developed in man than in the highest apes. The muscles of the head and neck, combining to keep the head and spine erect, also partake of an especial development. The *brain* of man differs from that of the highest apes in its great absolute size, measuring from 55 to 115 cubic inches. Its mass is thus larger in proportion to the body than in any ape, and the cranial nerves also present the same distinctive feature. The convolutions of man's brain are more numerous and complex and are less symmetrically disposed than in the apes. The cerebral hemispheres of man are relatively larger when compared with the cerebral nerves and with the cerebellum or lesser brain than in apes; and the posterior lobes of the cerebrum project behind the cerebellum to a much greater extent than in any of the Quadrumana. The gray matter of the brain, lying to its peripheral or external border, is said to be thicker in man than in the apes; and the *corpus callosum*, or great transverse band uniting the cerebral hemispheres, extends further backwards in man than in Quadrumana. The *senses* of man are present in great perfection, and attain, through their guidance by the intelligent will, a generally higher development than in other animal forms. The human body does not possess a perfect covering of hair, this being most abundant on the head, under the armpits, on the pubis, and on the front of the chest. The gorilla in its entire structure presents of all the apes the nearest approach to the human type taken also in its entirety; but there are other apes to be presently noted which approach more nearly to man when individual or special parts and structures are selected for comparison. The gorilla itself is most anthropoid in the curvature of the spine, in the general form of the pelvis, and in the large size of the heel. The proportions of the leg to the foot, and those of the foot to the hand, also approach most nearly to those found in man; and lastly, in the absolute capacity of the brain-case the gorilla of all the apes is most man-like. The gorilla, taken all in all, is thus structurally nearer to man than the baboons and lower apes are to the gorilla. The chief differences observable in the gorilla's structure when compared with the human type are in the relative number of vertebræ; the gorilla possessing thirteen dorsal and four lumbar segments, whilst man has only twelve dorsal and five lumbar. The presence of the characteristic interval or diastema in the teeth of the monkeys, and its absence in man, has already been alluded to. In the gorilla this gap exists in front of the upper and behind the lower canine teeth. The second and third molar teeth of the gorilla precede the canines in order of succession or development—this being different to the order of dental succession in man. The buttocks and calves of the gorilla are not nearly so prominent as in man, these muscular developments, as already explained, having reference to the maintenance of man's erect position. The orangs most closely approach man's structure in the number of ribs and in the form of the cerebrum; whilst they exhibit the greatest differences from him in the relative length of the limbs. The chimpanzees are most anthropoid in the shape of the cranium, in the arrangement and succession of the teeth, and in the length of the arms as compared with that of the legs. Of the higher apes the gibbons are those furthest removed from the human type of structure. (See the figures of skeletons and skulls in Pl. IV. VI.–VII.) The mental endowments of man, as already remarked, place him on a platform widely different, and separated by an illimitable gulf from all purely structural considerations. Chief among the psychical features, or rather among the results of the operation of the principle of *mind*, we note the possession of the moral *sense of right and wrong*, from which proceed the principles of ethics and of religion, and the acknowledgment of man's relations with his Creator. The possession of an articulate language, by which he can communicate his thoughts, is also the exclusive possession of man, and draws a sharp line of separation between him and all other animals. Difficult as it is to rightly estimate the *essentials* of man's psychical endowments, it appears that no condition of men is destitute of the elementary features of mind and of moral responsibility—features these which the influences of civilization tend to elevate into the highest qualities with which the Creator has seen fit to endow his creatures.

The geological history of man is one which has always been fraught with great interest, and concerning which much discussion has existed. Dealing as it does with the probable period of man's appearance upon the earth, and connecting us thus with man's early history—a history unwritten save in traces of his handiwork and habitations—the palæontology of the human race becomes inseparably linked with the first elements of religious belief, and with those traditions and tenets which the Christian religion has made peculiarly its own. It is not surprising, therefore, that the discussion of this subject has in some measure led to much discord between theology and geology; but leaving theology and its tenets out of the question, and working simply as scientific inquirers, geologists have found good grounds for insisting upon our recognition of man's advent upon this earth at a period much anterior to that which former limits and theological ideas prescribed.

The earliest traces of man which the palæontologist has yet discovered belong to the later post-tertiary, or quaternary period of geology. Traces of his handiwork in the form of rude implements abound in the superficial deposits of this period, and especially in the cave deposits. An attempt has been made to classify the relative ages of man in geological times by the nature of the implements found in the various deposits. Thus the rudest and most primitive age is known as the *stone age*, and is characterized by the presence of stone implements, evincing the first beginnings of man's efforts to assist himself in his daily operations by the manufacture and use of tools and appliances. Succeeding the stone age we find the *age of bronze*, and lastly comes the *age of iron;* this latter period indicating a great advance over the stone age, and necessitating the lapse of a vast period of time since that age; for man does not quickly advance from the ways of the rude savage to that of the semi-civilized worker in metals. Palæontologists have recognized the stone age itself as one of great extent, and including a lengthened period of time; and to the early stone period, with its ruder implements, the term *Palæolithic* (Lubbock) has been given; whilst the newer stone period, with its more elegant tools and weapons, has been named the *Neolithic* period. To the Palæolithic period belong the deposits in caves (for example, the Kirkdale Cave in Yorkshire), in which the *feræ* or wild animals of the district lived, or in which they died. Cave deposits yield a rich harvest of such remains, bearing evidence of man's presence and proximity from the gnawed appearance of the bones, and from the discovery of flint implements and the traces of fire. The animals which in all probability were thus contemporaneous with man, include the cave hyæna, cave bear, wolf, and fox, mammoth, woolly rhinoceros, hippopotamus, reindeer, Irish elk, &c. The great age of such deposits may be judged from the great change of fauna which has resulted in the extermination of some of these animals and the limitation of others to warmer regions of the earth; and also from the length of time required for the covering of these remains by a thick stalagmitic or limy deposit such as in some cases has been found in the caves. Besides cave deposits, the former levels (higher valley gravels) of rivers, with their alluvial deposits, also contain man's rude implements, associated with the remains of extinct mammals; and in the North of France and South of England particularly, the gravel deposits have yielded a rich harvest of flint implements and animal remains, the latter being those of mammals many of which (for example, lion, hyæna, mammoth, &c.) have long since become extinct in Britain and Europe generally. To the *neolithic* or newer stone period belong the *lake-dwellings* or *pfahlbauten* of Switzerland—ancient dwellings built on piles driven into the shallower waters of Swiss lakes, and which are known where they occur in Scotland and Ireland as *crannoges*. (See LAKE-DWELLINGS.) These lake-dwellings must have possessed a wide range in time, the older of them yielding stone, and the newer, bronze implements and fragments of rude pottery and cloth. The Danish *peat-mosses*, with their extinct—so far as Denmark is concerned—trees, the Scotch fir and oak, and their contemporaneous stone and bronze implements; and the *kitchen-middens* or *Kjokkenmoddinger* of the same country, consisting of large collections of the shells of cockles, oysters, &c., with their included *stone* and horn implements, belong to the neolithic period. And succeeding such deposits the bronze and iron age bring us to still more recent and superficial formations, and to the domain of the archæologist, and through this latter to historic times. In the later deposits man's remains and implements become associated with the remains of living Mammalia. The researches of geologists, it must however be noted, have almost entirely been confined to the deposits of Europe. The formations of Asia, in which continent man must have enjoyed a state of civilization whilst the early inhabitants of Europe were comparative savages, have yet to be fully investigated; and there can be no doubt but that the East is the region to which geology, archæology, and history point as that in which the earliest beginnings of human existence are to be found—if indeed they may be traced at all. And for the rise from savage life to civilization: for the progress from the rude sculptures of the stone age to those of architecture which even we deem ancient; and for the elevation of man from the condition of a higher brute to that of an intelligent responsible being, what immense periods of time are demanded and required! Such is the obvious conclusion to which calm and patient investigation leads, and such are the problems which the study of man in his geological relations involves.

MAN, ISLE OF (Latin, *Mona* or *Mona ins*), an island in the Irish Sea, about 31 miles from England, 32 miles from Ireland, and 18 miles south of Scotland. The extreme length, north-east to south-west, is about 30 miles, with an irregular breadth of about 12 miles at most; area, 145,325 acres, including the island Calf of Man at the south-western extremity of Man. Viewed from a distance, the general aspect of the island, though in some respects beautiful, is rather tame, for the hills, which extend nearly through its entire length, although of considerable altitude, neither tower up with sufficient abruptness nor assume picturesque forms. The highest point is Snaefell or Sneafell, about 2024 feet high. This range of hills, which occupies a considerable portion of the surface, is chiefly composed of clay-slate, containing some beds of roofing slate. Veins containing ores of lead, zinc, copper, and iron intersect the mountains in a northerly and southerly direction. The lead mines produced in 1881, 4183 tons of lead and 84,865 oz. of silver; the zinc mines, 3180 tons. The island is well watered, numerous springs and rivulets issuing from the hills. The northern district of the island is not so fertile as the southern, where land rents at 60*s.* and upwards the acre, but timber is more abundant in the former. The poorest land is in the middle. Agriculture has improved in recent years, but is still somewhat backward. The grain crops covered 25,211 acres in 1882, the green crops 12,046. The climate is salubrious and free from extremes of temperature; the mean of the year being 49° 59'. The greater portion of the island is in the possession of yeomen farming their own little estates, consisting of from 10 to 200 acres, and possessing mostly a portion of lowland with hill-pasture. The manufactures are almost entirely domestic. The herring-fishery is an important industry, there being more than 400 boats of 25 or 30 tons and upwards engaged in it. Agricultural produce is exported. The island has for some time been a favourite resort for summer visitors.

The government, political institutions, and laws of the Isle of Man are in many respects peculiar. The legislative authority is vested in the governor, council, and House of Keys: the last formerly a self-elected body of twenty-four individuals, but since 1866 elected by the people. The governor is chancellor and judge in all the superior courts. Two *deemsters*, officers of great antiquity, preside in their own summary courts, and have very extensive civil jurisdiction, and minor criminal cases likewise come before them; they also sit as the governor's assessors in the chancery and other superior courts. The

governor is appointed by the crown. The council consists of eight members; the Bishop of Sodor and Man being the senior member. The governor, council, and keys constitute the parliament or *Tynwald Court* of the island. No measure can be passed save with the governor's consent; the royal assent is likewise necessary to all acts of Tynwald, and no law comes into operation until it has been promulgated upon Tynwald Mount. The island is divided into six districts called *sheadings*, and these again are subdivided into seventeen parishes. Since 1866 the insular exchequer has received the whole surplus customs revenue after the payment of all expenses of government, and £10,000 a year contribution towards the imperial exchequer. It likewise receives from various sources, including royalties and minerals upwards of £12,000 a year. The surplus customs revenue has been sufficient to enable the insular government to construct large harbour works, including a deep water landing pier at Douglas. Upwards of a quarter of a million has been expended on these and other public works. One result of these improvements has been that within the last few years the number of summer visitors to the island has increased from 50,000 or 60,000 to upwards of 120,000. The established religion is that of the Church of England, under the Bishop of Sodor and Man, who has a seat without a vote in the House of Lords. The Manx language, a Celtic dialect, is still in use, although all the inhabitants speak English. The principal towns are Castletown, Douglas, Peel, and Ramsey. There are railways from Douglas to Peel on the opposite side of the island, and to Port Erin in the south-west. In 1882 415,939 tons of shipping entered, and 412,891 tons cleared at the ports of the Isle of Man. Pop. in 1881, 54,089.

This island was originally peopled by the Manx (*Menarii*), a Celtic tribe. It was conquered by Edwin, king of Northumbria, about 614, was taken by the Norwegians in 1098, sold to the Scots in 1266, and was repeatedly occupied by the English and Scots up till 1344, when it remained in possession of the former. It was latterly held as a feudal sovereignty by the earls of Derby, and more recently by the dukes of Athole, from whom it was purchased for the British crown in 1764 for £70,000; and finally, in 1829, certain remaining privileges were ceded by the duke on receiving an award of £416,000.

MANAAR, Gulf of, is the tract of sea lying between the Island of Ceylon and the east coast of the southern extremity of Hindustan, being separated from Palk's Strait by a long line of sandbanks called Adam's Bridge, which runs between the two islands of Manaar and Ramisseram. The gulf is about 130 miles wide at the broadest part, but is so full of sandbanks and shoals as to render its navigation difficult, if not impossible, by vessels of large burden. It possesses many extensive fisheries, and abounds in pearl banks and chank-shells.

MANACOR, a town of Spain, on the Island of Majorca, 30 miles east of Palma, on a gentle declivity. It is well built; has several spacious squares, and wide, well-kept streets. Its buildings are substantial; the most important are the palace of the ancient kings of the country, a large parish church, a chapel of ease, town-house, prison, two schools, and an hospital. It has also manufactures of brandy, wine, oil, and verdigris; and some trade in grain, oil, cattle, sheep, and fruit. Pop. 14,894.

MANAGUA, a town in Central America, capital of the state of Nicaragua, near the south-west shore of the lake of same name, 32 miles s.s.w. of Leon. It consists of long rows of huts, and a large square lined with houses of two stories. The centre of the square is occupied by a large church, and there is another large church with a conspicuous white arched portal. The inhabitants, chiefly Indians, are very industrious, and show great dexterity in imitating articles of foreign manufacture. Pop. about 12,000. The *lake*, about 38 miles long, discharges itself into that of Nicaragua, above which it has an elevation of 16 feet, while its elevation above the Pacific is 156 feet. It has attracted a good deal of attention in consequence of its supposed capability to form part of a proposed navigable communication between the Atlantic and Pacific.

MANAKIN (*Pipra*), a genus of Dentirostral birds included in the order Insessores or Perchers. These birds, generally of small size, inhabit tropical America, and like most other birds of that region, exhibit a singular beauty of plumage. They are gregarious in habits, lithe and active in their movements, and feed on insects and fruits. The bill is somewhat compressed, being broad at its base, and possessing the tip or apex greatly curved. The tail is short, or at most of moderate length. The tarsus is elongated, the feet being short, and the outer toes partly united to the middle digits. The nasal fossæ are of large size, and the nostrils themselves are generally covered by the plumage of the head. The *Pipra militaris* possesses a frontal crest or plume of bright red feathers, and is a familiar species of these birds, besides being one of the largest members of the genus. The back is coloured deep-blue, and the rest of the plumage is jet black. The only true manakin inhabiting a different region from South America is the *Calyptomena viridis*, found in Sumatra. The plumage of this form is of a green colour, closely resembling that of the leaves amid which it perches. Nearly allied to the manakins is the *Rupicola aurantia*, the 'Cock of the Rock,' which attains the size of a pigeon, and possesses a double crest of feathers which meet in the middle and form a fan-like appendage to the head. The tail-coverts are also long and curved, and thus constitute a cock-like tail. The plumage is orange-coloured, the wing-quills and tail being black. It inhabits Guiana, and makes its nest in the crevices of rocks. These birds appear to live on fruits, and to resemble the Rasorial birds in their scratching habits as well as in general appearance. A Peruvian species has also been described under the name of the *Rupicola Peruviana*. (See Pl. CXLII.-CXLIII. fig. 2.)

MANASAROWARA, a lake of Tibet, among the Himálaya Mountains, is one of the most venerated of all the places of pilgrimage resorted to by the Hindus, who visit it in great numbers in spite of all the difficulties of the journey. The Tibetans also hold it in great reverence, and come from great distances to throw into it the ashes of their friends. It is about 15 miles long and 11 broad, and with its borders of lofty crags, and its towering barrier of snow-capped mountains, forms a magnificent scene. Its shores are covered with monastic houses.

MANASSEH, eldest son of Joseph, born in Egypt. When brought with Ephraim to receive the blessing of his grandfather Jacob, the old man placed his right hand upon the head of the younger, and his left upon that of Manasseh, thus depriving the latter of the precedence due to his priority of birth. The descendants of Manasseh formed a tribe, which, in the Promised Land, was settled half beyond the Jordan, and half in the territory of Samaria, Sichem, and Bethany.

MANATEE (*Manatus*), an aquatic mammal included in the order Sirenia, and formerly classified with the Cetacea or Whales, from which, however, it is structurally distinct and separate, being more nearly allied to the Ungulata or hoofed quadrupeds. The body is somewhat fish-like in general conforma-

tion, and is terminated posteriorly by a tail-fin, which is not supported by true fin-rays like the tail of fishes, and also differs from the latter in being placed horizontally instead of vertically. No hind limbs are present, and a sacrum is also wanting. The fore limbs exist in the form of swimming-paddles, rudimentary nails being developed upon the four outer digits of these anterior extremities. A prominent snout exists, and the nostrils, which are separate and distinct, are valvular in structure and can be closed at will. The nostrils are placed above the extremity of the snout. An external ear is absent, and a nictitating membrane or 'third eyelid' is developed. The body is but sparsely covered with hairs. A dorsal or back fin is never developed as in some cetaceans, and the neck is but faintly marked; the junction of head and body being closely set. In the manatee there are but six cervical or neck vertebræ—this being a somewhat rare exception to the ordinary number (seven) of these vertebræ in mammals. The breasts are two in number, and are placed upon the chest. These animals have the habit of raising themselves out of the water upon their hinder parts; and their appearance, added to the position of the mammæ, may have given rise to the stories of sirens and mermaids so often related by credulous navigators. From this latter circumstance or supposition, indeed, the name *Sirenia*, given to the manatee order, has been derived. The manatees possess eight molar teeth in each side of each jaw, and two upper incisors of small size, which are developed in the young state only. These animals inhabit the estuaries of rivers and the shallow waters of the east coasts of South and North America and of the west coast of Africa. The African species is named *Manatus Senegalensis*, the American Manatee being the *Manatus Americanus*. They feed exclusively upon vegetable matter, and attain an average length of from 8 to 10 feet, although these proportions are frequently exceeded. The popular name of 'sea-cows' has been given to the manatees and also to the only other genus included in the order Sirenia—the Dugongs (*Halicore*). (See DUGONG.) And in addition to these two forms a third may be added, the now extinct *Rhytina* (which see), which was last seen in Behring's Straits about 1768. (Pl. XXXVI. XXXVII. fig. 5.)

MANCHA, La, an ancient province of Spain in New Castile, almost every way surrounded by mountains, forming an immense plain intersected by ridges of low hills and rocks; not an inclosure of any kind except mud walls about the villages; not a tree to be seen except a few dwarfish evergreen oaks and olive plants scarce deserving the name. All this vast tract of open country is cultivated in corn and vines. This is the most cheerful country of Spain; the inhabitants are affable, and great lovers of music and dancing. La Mancha forms the chief part of the province of Ciudad-Real. Chief towns, Ciudad-Real and Ocana.

MANCHE, La, a department, France, bounded on the east by Calvados, on the south-east by Orne, and on the south by Mayenne; and washed on the west, north, and north-east by the Atlantic. It is about 80 miles long by 30 broad, and has an area of 2293 square miles. It is divided into six arrondissements, forty-eight cantons, and 643 communes. Principal towns, Saint-Lô, the chief town, Cherbourg, Avranches, Coutances, and Granville. The surface is very unequal, varied, and often extremely picturesque. About three-fifths are under cultivation, the rest being chiefly meadow-pasture and forest lands. Along the shores there are extensive swamps, alternately covered by the tide and dry at its ebb. The principal crops are a species of black oats and potatoes. The orchards, widely spread over the interior, produce great quantities of cider. Much attention is paid to the dairy, and the horses, of the celebrated Norman breed, though somewhat deteriorated, are still excellent. Lead and iron are partially, and granite is very extensively worked. Pop. 527,377.

MANCHESTER, a municipal and parliamentary borough, and the most important manufacturing city of England, occupies chiefly a low tract of ground on the Irwell, at the confluence of the Medlock and the Irk, 188 miles north-north-west from London by railway, and 32 miles east by north of Liverpool. The old town of Manchester proper, and the large and populous townships of Hulme, Chorlton, Ardwick, Cheetham, &c., are situated on the east or left bank of the Irwell, whilst the extensive borough of Salford is situated on the right bank; the communication by eight bridges serves to make them practically one city. The city, owing to the lowness of its site and the tenacious subsoil on which it is built, as well as to the tainting of the streams by the numerous public works established on their banks, has been considered somewhat unhealthy; but now many of the causes of disease have been greatly modified by improved drainage and the introduction of an abundant supply of pure water. If Manchester cannot boast of many venerable structures embodying the conceptions of master-minds and rich in historical recollections, it has comparatively few of the narrow, crooked, and crowded lanes by which large towns of ancient date are more or less characterized, while it can point to spacious streets and squares lined with public and private buildings, generally of a most substantial, and not unfrequently of a magnificent description. The most important streets are Market Street, continued in the line of Piccadilly and the London Road nearly across the centre of the city; Mosley Street, Cross Street, Deansgate, King Street, Portland Street, &c. Of the public buildings in Manchester worthy of notice the churches, of which there are nearly 300, may be first mentioned. Among the Established churches the first place is due to the cathedral (formerly the collegiate church), a fine specimen of perpendicular Gothic, built in 1422; but the soft stone of which it is built having necessitated numerous repairs, the edifice has a comparatively new appearance. The side chapels add greatly to its width, which is 112 feet across the nave; the length of the building is 220 feet. The choir contains the bishop's throne and thirty stalls covered by elaborately-carved oaken canopies. Among the other Established churches we may mention St. Ann's, a Grecian structure near the centre of the town; St. Peter's, Mosley Street, in which is a picture by one of the Carracci; St. John's, Byrom Street, has a tower with a peal of bells, and a marble monument by Flaxman; St. Matthew's, Campfield, a large handsome building of modern Gothic, with a lofty tower and fine organ; St. James', Collyhurst; Trinity, St. Philip's, and St. Simon's, in Salford; Holy Trinity, St. George's, and St. Mary's, in Hulme. Among the non-established churches the most deserving of notice are St. John's Roman Catholic in Salford, which ranks as a cathedral; it has a spire 240 feet high, and a splendid interior; the church of the Holy Name, Oxford Street, and St. Chad's, also belong to this body. The Independents have a fine church in Cavendish Street, and the other Dissenting bodies own many handsome edifices. Among the municipal and commercial buildings most worthy of mention are the assize courts, opened in 1864, a splendid Gothic building, 270 feet long and 140 feet deep, with a tower 210 feet high. To the rear of this building is a jail, completed in 1867, mediæval in character and of great extent. The old town-hall, King Street, built in the Greek style, is now used

as the Free Reference Library. The new town-hall (opened in 1877) is a splendid building, probably the finest of the kind in the kingdom, having its principal front, 328 feet long, towards Albert Square; the front in Princess Street is 387 feet long, that in Lloyd Street 350 feet. The building covers altogether 8000 square yards, and cost over £1,050,000. The new exchange is a spacious Italian edifice; the great hall has a clear breadth of 105 feet and a length of 205 feet. The new stock exchange forms part of a vast structure called the Commercial Buildings, the large room being 66 feet long and 46 broad, with reading-rooms, &c., attached. The corn exchange has a handsome front of six Ionic fluted columns, and can hold 2400 persons. The Free Trade Hall, in the Lombardo-Venetian style, was built in 1856 at an expense of £40,000. It is one of the finest concert-rooms in the kingdom, and has been the scene of many great political demonstrations. The large hall is 134 feet long by 78 broad, and can hold 5000 persons. Other important edifices are the new city court-house, the Salford town-hall, the branch Bank of England, the Smithfield Market, the Manchester and Salford workhouses, and the borough jail. First among the monumental ornaments is the Albert Memorial, in front of the new town-hall, erected at a cost of nearly £7000. The statue, of Sicilian marble, executed by Noble, represents the prince in the robes of the order of the Garter. Statues of the Duke of Wellington, Sir Robert Peel, Dr. Dalton, and James Watt have been placed opposite the infirmary; one of Cobden in St. Anne's Square, and of Cromwell in Victoria Street; and in Peel Park are those of the Queen, Prince-consort, Sir Robert Peel, and Joseph Brotherton. The more important educational and literary institutions are Chetham's Hospital, founded under the will of Humfrey Chetham in 1653 for the education of poor boys (forty was the original number, but it has now been increased to 100) between the ages of six and fourteen, when they are apprenticed with a small premium. It is a very old building, occupying the site of the Baron's Hall. Attached to the institution is a library of nearly 40,000 vols., among which are many valuable MSS., early printed books, and literary rarities. It is freely open to all, resident or stranger. The Owens College was founded in 1846 by a bequest of upwards of £100,000 from John Owens. (See OWENS COLLEGE.) The Lancashire Independent College was built as a theological academy, and will accommodate about fifty students. The free grammar-school, founded in 1520, has a great number of exhibitions at Oxford or Cambridge. The Commercial Schools furnish a complete course of education to the middle classes. The Ladies' Jubilee School was founded to promote the education of poor girls (forty in number), and trains them for domestic service. Among the other schools may be noticed the Girls' High School, the Nicholl's Hospital for the education of poor boys, and many large Board Schools. We can do no more than mention the Literary and Philosophical Society, established in 1781; the Chetham Society, established in 1843 for the publication of literary and historical remains connected with Lancashire and Cheshire; the Free Library, established 1851, with a reference library in the main building of 80,000 vols., and six branches with 90,000 vols.; the Geological Society, the Statistical Society, the Medical Society, the Law Association, the School of Art; the Royal Institution, whose large building has been handed over to the Corporation, and was opened in 1883 as the City Art Gallery; the Literary Club, the Field-Naturalists' Society, the Athenæum, the mechanics' institution (recently reorganized as a technical school). Besides the benevolent institutions already mentioned, there are the royal infirmary, the blind asylum, the deaf and dumb asylum, the lunatic asylum; the eye, lock, Salford Royal, and St. Mary's hospitals, &c. The public baths and wash-houses are now managed by the corporation. The places of recreation comprise three theatres, a large and handsome concert-hall, and the Free Trade Hall, where a series of concerts has been given for many years. For open-air amusements there are the botanical and horticultural garden; the Queen's, Alexandra, and Philip's parks; and the Belle Vue zoological and Pomona gardens; the Peel Park, Salford, with an excellent museum, and covering an area of 40 acres. The chief cemeteries are the General Cemetery at Harphurhey, covering nearly 11 acres; a larger one at Withington, called the Southern Cemetery, the Wesleyan Cemetery at Chetham, the Roman Catholic Cemetery, Moston, the Philip's Park Cemetery, and one of 21½ acres for Salford near Eccles.

Manufactures and Trade.—To these Manchester owes its rapid rise and almost all its present importance. Its site in these respects is particularly fortunate. It stands close to one of the largest and most valuable coal-fields of England, at such a convenient distance both from the west and east coasts as to form a natural emporium for the traffic of the Atlantic and German Oceans; and on the Irwell, which, joining the Mersey, has been made of considerable value for navigation. A net-work of canals furnished communication between Manchester and the chief surrounding towns before the birth of the railway system, so that with the additional accommodation provided by the latter one might think little more was to be desired in regard to facility of transport. Recently, however, a movement has been started to still further facilitate and extend the commerce of Manchester by connecting it with the sea by a ship-canal. In the constructing of this canal, which would have a length of 50 miles, the rivers Irwell and Mersey would be utilized, their channels being straightened and deepened, and a new channel cut for the lower portion of the canal. There would be several locks on the canal, with large docks at Manchester, the estimated cost being £5,400,000. The staple article of manufacture and trade is cotton, from the working of which the name of the town and its goods have become household words throughout the civilized (and we may add the uncivilized) world. In more immediate connection with the cotton manufacture are numerous bleach-works, dye-works, print-fields, chemical works, and engine-factories. Besides articles of pure cotton and pure silk, mixed goods, in which silk and cotton, silk and wool, cotton and wool, are combined, are manufactured to a considerable extent. Forges and foundries are numerous, and there are also some important works devoted to the paper trade. The following table from a report furnished by the inspector of factories, gives some accurate information in regard to the subjects to which it relates:—

Classification.	No. of Works.		Hands Employed.
Textile Fabrics and Wearing Apparel	1,333	..	43,595
Metal Manufactures	365	..	12,616
Leather Manufactures	74	..	677
Chemical Works	28	..	1,572
Manufactures connected with Food	40	..	604
Manufactures connected with Building, &c.	500	..	4,427
Paper Manufactures	23	..	581
Miscellaneous Manufactures	411	..	9,133
Total	2,783	..	73,235

The borough of Manchester comprises the townships of Manchester, Chorlton-upon-Medlock, Hulme, Ardwick, and Chetham, and also the small extra-parochial district of Beswick, and was incorporated

by royal charter in October, 1838. The management of local affairs is in the hands of sixty-four councillors, who elect from their body sixteen aldermen and a mayor, and appoint committees for the transaction of the various departments of public business, such committees reporting their proceedings for approval at the general meetings of the council. Manchester has a separate commission of the peace and court of quarter-sessions. There is an efficient constabulary force under the control of the watch committee of the council. The council have also under their management the extensive gas-works, from which, notwithstanding that frequent reductions in the price of gas have been made, an annual profit of upwards of £60,000 is realized, which is expended in city improvements. Before the incorporation of the borough Manchester was dependent for its water supply upon wells and pumps. A company was formed to improve this state of affairs, but ultimately the corporation bought it up and constructed works upon a suitable magnitude. Extensive gathering grounds and reservoirs were constructed at Woodhead on the Sheffield route. The cost was upwards of £1,200,000. Further powers have been obtained from Parliament to construct additional water-works at Thirlmere in Westmoreland, estimated to cost £2,000,000.

History.—Manchester was known at a very early period. Details of a speculative nature have been given by some writers as to its pre-Roman condition; but it is certain that on the invasion of Lancashire by Julius Agricola (A.D. 79) a Roman station was founded at Mancunium, which was probably a conversion of a fortress of the Brigantes, said to have been called *Manconion*. At Castlefield urns, votive altars, coins, &c., have been discovered at various periods. After the Romans withdrew, the Saxons, about 488, wrested Mancunium from the Britons, but were again forced to restore it. In 620 it was taken by Edwin, king of Northumbria, and was shortly after occupied by a colony of Angles. About this time the old name of Mancunium seems to have been supplanted by its Saxon form *Mameastre* or *Manecestre*. The conversion of the inhabitants to Christianity is said to have been effected about 627 by the preaching of Paulinus, and a church dedicated to St. Michael was erected. Manchester next passed to the Danes, who were expelled about 920 by Edward, king of Mercia. This prince repaired the castle, leaving in it a strong garrison, and raised the town from the ruins into which it had fallen while half-barbarous chiefs were contending for its possession. Its charter, conferring the privilege of a borough, was granted in 1301. Manchester cotton is heard of for the first time in 1352; but the article so designated, notwithstanding its identity of name, had nothing in common with the modern fabric, being in fact a woollen cloth of coarse texture woven from the unprepared fleece. At this time the manufacture of broad-cloth was introduced by the Flemings, and made considerable progress. In 1422 the church (now the cathedral) was built and collegiated. The collegiate body, which had for its residence a building at Hunt's Bank, on the site of the old Baron's Hall, was dissolved in the reign of Edward VI., and the building subsequently became the property of the Derby family. It is now the Chetham Library and hospital. During the civil war possession of Manchester was keenly disputed, and the town suffered much at the hands of both parties. About this time it is described as being 1 mile in length, with good streets and buildings, and a very industrious population. Its progress since has been extraordinarily rapid. It has played an important part in the political history of the age, especially in connection with the agitation for parliamentary reform and the establishment of free-trade. The civil war in America led to a cotton-famine, which in 1862 caused the deepest distress in South Lancashire, and called forth help from sympathizers in all parts of the world. The Art Treasures Exhibition in 1857 should also be remembered. Manchester and Salford were enfranchised by the reform act of 1832. Manchester now returns three members to the House of Commons, and Salford two. The population in 1773 amounted only to 26,426; in 1891 it was 106,798; in 1881 the population of the municipal borough was 341,414, parliamentary borough 393,585; the population of Salford was, for the municipal and parliamentary borough (coextensive), 176,235; pop. of both boroughs, and immediately contiguous urban sanitary districts, about 800,000.

MANCHESTER, a town in the United States, New Hampshire, on the Merrimac, at the Amoskeag Falls, and at the terminus of the Merrimac and Connecticut, and the Manchester and Lawrence railways, 59 miles north-north-west of Boston. It is regularly laid out in streets and squares, the former crossing at right angles, and three of the latter with ornamental ponds in their centre. The main street, which is 100 feet wide and above a mile long, is planted on each side with elms. The principal buildings are the town-house, the county court-house, the state reform school, a Roman Catholic convent, an orphan asylum, two opera-houses, the city library, &c. The manufactures, having the advantage of an unlimited supply of water-power from the falls of the Merrimac, are important. The chief articles manufactured are cottons and woollens, locomotive and other engines, edge-tools, castings, scales, and paper. The cottons and woollens, which must be considered as the great staples of the place, consist of ticks, flannels, sheetings, drillings, de laines, barèges, prints, and cassimeres. As recently as 1838 it was a village with about 50 inhabitants; in 1880 the population was 32,630.

MANCHESTER PARTY or SCHOOL, the name given to the political party, whose exertions were particularly directed to the development and thorough carrying out of the principles of free-trade. They came forward as a compact party in the Anti-Corn Law League, and had their chief seat in Manchester. Since the abolition of the corn laws this party have extended their programme, and agitate in favour of non-intervention in foreign affairs, of arbitration instead of war, &c. Several eminent statesmen have been connected with it, among others Richard Cobden and John Bright.

MANCHINEEL (*Hippomane mancinella*), a West Indian tree, celebrated for the poisonous qualities of the milky juice which abounds in every part of it. When a drop of the juice is applied to the skin it causes the same sensation as a burning coal, and quickly produces a vesicle. The Indians use it for poisoning the points of their arrows, which preserve their venom for a long time. The workmen employed in felling these trees first build a fire round the trunks in order to make the juice evaporate, and cover their eyes with gauze; but, notwithstanding these precautions, they are subject to be incommoded with the dust. The accounts, however, which represent it as dangerous to sleep in the shade, or to come in contact with the rain which has fallen upon this tree, are highly exaggerated. The inhabitants of Martinique formerly burned entire forests of the manchineel, in order to free their dwellings from its presence. The tree belongs to the natural order Euphorbiaceæ; the leaves are alternate, ovate, serrate, and shining; the fruit has the form, colour, and scent of a small apple, and contains a nut about as large as a chestnut. It is said that drinking copiously of

sea-water is the best remedy when a portion of this fruit has been swallowed. The manchineel grows in the West Indies and other parts of tropical America, near the ocean.

MANCHOORIA, or MANCHURIA (Chinese, *Shing-King*), a territory belonging to the Chinese Empire. It occupies the east extremity of the great Asiatic plateau, and extends, since the cession of portions of the territory to Russia in 1857 and 1860, between lat. 40° and 53° N., and lon. 118° and 133° E., and is bounded on the north and east by the Amur or Amoor and Usuri, which separate it from the Russian territory; on the west by the provinces of Irkutsk, Mongolia, and Tchi-li; on the south by the Gulf of Leaotung, the Yellow Sea and Corea. The principal rivers are the Amur, the Songari, the vast basin of which occupies a great part of the territory; the Argun and Usuri, like the Songari, tributaries of the Amur; and the Leao-ho, watering the province of Leaotung, falling into the gulf of that name. Manchooria is divided into three provinces—Shing-king, Kirin, and Tsi-tsi-kar. Shing-king, which includes the ancient province named Leaotung, lies between Tchi-li and Mongolia on the west, the Gulf of Leaotung and the Yellow Sea on the south, Corea on the east, and a palisade of stakes, with twelve stations guarded by soldiers, which forms its north-west boundary. Its principal town, and the capital of Manchooria, is Moukden, about 200 leagues north-east of Pekin. The province of Kirin is now comprised within the Sagalien on the north, Tsi-tsi-kar, Mongolia, and Shing-king on the west, Corea to the south, and the river Usuri to the east. Kirin, on the Songari, is the chief town of the province. The province of Tsi-tsi-kar, is now bounded north and north-east by the Amur and Russian possessions, west by Argun, south by Mongolia, and south-east by the province of Kirin. The principal town is Tsi-tsi-kar, situated on the Nouni. Vast chains of mountains ramify all over the country, one of them forming the south limits of the valley of the Amur. The aspect of this vast system of mountains and valleys is generally arid and desert. The cold of winter is intense, the thermometer sometimes falling to 30° below zero, and the snow lying for six months in the year. The southern districts of Shing-king and Kirin produce wheat, barley, millet, and some vegetables. Horses and cattle are also raised. The vast forests of the north are rich in useful timber of all kinds, and harbour the tiger, panther, bear, wolf, and stag, as well as the eagle and other birds of prey. The rivers abound with fish. The pearl-fishery on the coast is a government monopoly. The principal food crops are pulse, millet, barley, and wheat. The vine, indigo, cotton, opium, tobacco, &c., are cultivated, opium being far more valuable than any other product. The silk-worm is reared by the inhabitants. The government of Manchooria, confined exclusively to the Manchoos, has at its head a civil dignitary, resident at Moukden, who has three subordinate military commanders to administer the three provinces. The Manchoos are a Tungusian race. They are of a lighter complexion and a more powerful build than the Chinese, have the same conformation of the eyelids, but their countenances are far more expressive and intellectual. In the seventeenth century they invaded China, and placed their leader's son upon the throne. Since that time the Manchoo dynasty has continued to reign in China, and the Manchoo language has become the court and official language. By the gradual advance of the Russians into the territories north of the Amur, and their locating there a chain of settlements, they have obtained so firm a footing as to bring about the cession of territory already mentioned. Pop. 2,000,000.

MANCHUS, or MANCHOOS. See preceding article.

MANDALAY. See MANDELAY.

MANDAMUS. A writ of *mandamus* (we command) is, in general, a command issuing from some superior court, in the great majority of cases from the Court of Queen's Bench, directed to some inferior court, or to some person or corporation, requiring them to do some particular thing, which such superior court has previously determined it to be their duty to do, or at least supposes to be consonant to right and justice. It issues where a party has a right to have a thing done, and has no other remedy, and in some cases where he has another but a tedious and inadequate one; and must be applied for without delay. It is either in the alternative, ordering the court, corporation, or party to which or whom it is directed to do the thing specified, or to appear and show cause why it should not be done; or absolute, commanding the thing specified to be done without any condition or alternative. The writ is usually first issued in the alternative, directing the party complained of to appear and show cause against its being issued absolutely, and in case of there being no appearance, or no sufficient cause to the contrary being shown, an absolute mandamus is issued. The cases enumerated for the issuing of this writ are—to compel the party applying to be restored to some office or franchise of a public nature, whether temporal or spiritual; to an academical degree; to the use of a meeting-house, &c.: it lies for the production, inspection, or delivery of public books and papers; for the surrender of the regalia of a corporation; to oblige bodies corporate to affix their common seal; or to compel the holding of a court. It may be directed to an inferior court, ordering it to proceed in the hearing of a cause, or to enter up a judgment. It is sometimes directed to a corporation, directing them to choose officers. The statute of 2 Geo. II. cap. iv. provides for its being issued to command an election of a mayor or other chief magistrate of a city, town, or borough; and so, where one is elected to any office, as town-clerk, or is legally elected member of any public body, as one of the aldermen of a city, and is refused admission or recognition as such, this writ may be issued in his behalf. The proceedings on mandamus have been remodelled by the Common Law Procedure Acts, 1852 and 1854, so as to nearly resemble those on an ordinary action.

MANDARIN, the term usually applied by foreigners to government officials of every grade in China. It is supposed to be derived from the Portuguese *mandar*, to command, or from the Sanskrit *mantrin*, counsellor; the Chinese equivalent is *kwan*, which signifies literally a public character. Mandarins are either civil or military, and of each order there are nine classes, each class being again divided into two sub-classes. The position of a mandarin is obtained by open competition, but offices and titles are sold to a great extent. Although inferior in rank to the higher nobility, the mandarins form the effective ministry and magistracy of the country, and also fill the chief ranks in the army.

MANDARIN DUCK. See TEAL.

MANDAT, the name given to a certain kind of paper-money in the French revolution. After the *assignats*, which had been kept in circulation by the violence of Robespierre, had lost all credit, a new money was created—the *mandats*—founded, like the *assignats*, on the credit derived from the confiscated property, but with the essential difference that specific pieces of property, enumerated in a table, were pledged for the redemption of the bills, whilst the assignats furnished only a *general* claim. The mandats could be realized at any moment, as the owner was authorized to take any portion of the property

enumerated on the table, as soon as he made his intention known and paid the quarter part of its assigned value, without any further formality. These mandats were issued in accordance with the law of March 18, 1796, to the nominal value of 2,400,000,000 francs. A forced circulation was given to them, by which the government was enabled to defray the expenses of the approaching campaign. This was hardly done when they also sank to nothing; they were, therefore, in part redeemed, while the rest disappeared of themselves.

MANDELAY, or MANDALAY, the new capital of the Birman Empire, founded in 1857. It is situated in a dry and dusty plain, about 28 miles northward from the former capital, Amarapura, and between 2 and 3 miles from the eastern bank of the Irawady. It consists of four concentric quadrangles, of which the innermost contains the royal palace and connected establishments, with gardens and pleasure-grounds, the higher courts of justice, &c. The second contains the houses of the government officials, officers, and soldiers, which are arranged in broad streets, crossing each other at right angles. This quarter is surrounded by a deep moat and a high wall flanked with towers, the four massive gates of which are shut every evening. Outside dwell the merchants, the artisans, and the general body of the people. Pop. estimated at 100,000.

MANDEVILLE, BERNARD, a writer and physician of considerable temporary celebrity, was born in Holland about 1670; died in 1733. He was probably of English extraction, as he fixed his residence in England, and wrote his works in the English language. His most celebrated production is the Fable of the Bees, or Private Vices Public Benefits, the first part of which appeared in 1723, and the second in 1728. The reasoning in this piece is founded on the sophism that the luxury and superfluity which mark the advanced stages of society, and the vices which they engender, are often the causes of national prosperity, and hence the necessary prevalence of vicious principles in human nature. Consistently with this doctrine his general views of mankind are of the most disparaging tendency; and he declares against all attempts to exalt the humble classes by education. Many answers appeared, among which was one by Bishop Berkeley in his Alciphron, to whom he replied in 1732 in his Letter to Dion. Among his other works are Free Thoughts on Religion (1720), and Origin of Honour (1732).

MANDEVILLE, SIR JOHN DE, a celebrated English traveller of the fourteenth century, was born at St. Alban's about 1300. He was of a respectable family, and bred a physician; but a desire to visit foreign countries induced him, while still a young man, to set out upon a course of travels, in which he is said to have spent thirty-four years. During this period, according to his own account, he visited the greater part of Asia, Egypt, and Libya, making himself acquainted with many languages, and collecting a great mass of information, true and false, which he committed to writing first in Latin, and then in French, English, and Italian. He died in 1371 or 1372 at Liége, where a monument is erected to his memory. The best edition of his travels, entitled the Voiage and Travaile of Sir John Maundevile, Knight, is that of Halliwell (1839), a reprint of the edition of 1725, which was taken from a MS. of the fourteenth century in the Cotton Library, written in the Midland dialect. His extreme credulity in the collection of absurd and fabulous stories, rather than his own mendacity, has led to his being regarded as a sort of English Münchhausen. His accuracy in describing all that came under his immediate observation has been confirmed by subsequent travellers.

MANDIBLE, the term applied in the comparative anatomy of Vertebrates to the lower jaw; and in the description of Invertebrate forms, to the larger jaws or organs connected with the mouth and concerned in the mastication of food. Thus in Insects the upper or larger jaws, two in number, are termed mandibles; and in Crustacea a pair of corresponding structures are similarly named. In Spiders and Scorpions (Arachnida), two mandibles are also present, these organs in the spiders being terminated by hooked fangs connected with a poison-gland; whilst in the Scorpions they possess terminal, pincer-like claws or *chelæ*. The term 'mandible' is also given to the horny or calcareous jaws found in the Cephalopods or cuttle-fishes.

MANDINGOES, a well-known tribe of West Africa, remarkable for their intelligence, and generally for the advances they have made in civilization. The original country of this people, who are now spread over a great portion of West Africa, was the north slope of the high table-land of Senegambia, between the head-waters of the Niger and Senegal. Their language is more widely diffused, and more employed by translators, than that of any of the other languages of West Africa. The personal appearance of the Mandingoes is prepossessing; their features are regular and open; their figures well formed and comely, averaging a height rather above the common. The costume of the Mandingoes is extremely plain, but neat and becoming, consisting of a cap, shirt, trowsers, and sandals. They formed at one time a single large empire, but are now divided into not less than sixteen different states. Their religion is Mohammedan, but they are not rigid in its observances.

MANDOLA, or MANDOLINE, an instrument of four strings, belonging to the lute and guitar species, and played with a quill as well as with the finger. There are also instruments of this kind with six or more strings. It is chiefly in use in Italy, and is pleasing when it accompanies the easy song of the country people. The strings are of steel or brass.

MANDRAGORA and MANDRAKE, a name given by the ancients to a root which grew cleft into two parts, and resembled the human form. Hence miraculous powers were attributed to it, and the herb it produced was called *circæum*. According to Josephus (Antiquities, book viii. chap. 2) Solomon had such a plant, which drove away demons. Pliny in his Natural History (lib. xxv. cap. 13) directs how it should be dug up; and Josephus, who called it *baaras*, states something similar. This root was supposed to have a double sex, and to make prolific; hence commentators on the Bible have conjectured that it was the fruit which Rachel desired of Leah, according to Genesis xxx. 14. The mandrake (*Mandragora officinalis*) of botanists belongs to the natural order Atropaceæ, the deadly nightshade order. The root is perennial, and 3 or 4 feet long; the leaves are radical, sessile, ovate, entire, and waved. There is no stem; but the flowers, which are white, with a bell-shaped corolla, stand upon simple stalks. The fruit is a large two-celled berry of an orange colour, containing many kidney-shaped seeds. The plant is a native of the south of Europe, where it flowers in March and April. It is not uncommon in English gardens. The root possesses narcotic qualities in considerable strength, but it is rarely employed in modern medicine.

MANDRILL (*Cynocephalus maimon*). This quadrumanous mammal is included in the section *Catarhina* or that of the Old World monkeys, distinguished by the oblique, closely-set nostrils, and by the opposable thumbs of both extremities. The mandrill forms a species of the baboon genus (*Cynocephalus*), which is distinguished by the short or rudimentary tail, by

the elongated dog-like muzzle, and by the presence of natal callosities which are generally brightly coloured. The mandrill inhabits Africa, and may attain the height and proportions of an ordinary man. The cheek protuberances are coloured with stripes of brilliant red and blue; the natal callosities being of a brilliant red colour. These animals are exceedingly strong and muscular, fierce in disposition, and under ordinary circumstances difficult to tame. Specimens of the mandrill have been brought alive to Europe, and may be seen in travelling menageries and zoological collections. The body colour is generally a brownish-gray, the chin being provided with a lighter coloured beard. The Guinea Coast is the region chiefly inhabited by the mandrill; and among the negroes of this coast these monkeys have an evil reputation, founded presumably on their fierce character. The food appears to be chiefly, or almost entirely, of a vegetable nature. The favourite mode of progression is quadripedal—these forms rarely assuming the semi-erect posture. (Pl. VI.–VII. fig. 9.)

MANE, the tufted ridge of hair borne upon the upper surface of the neck, and extending in some cases along the back of certain mammals. As a rule, and as in the lions for example, the male animals possess the largest and most fully developed manes. In the lions also the mane gives to these animals their majestic appearance; and this appendage does not become fully developed until the adult stage is attained.

MANES, among the Romans, the souls of the dead. The good spirits were also called *lares*, and the evil *larvæ*. The manes were reckoned among the infernal gods; but a belief was prevalent that they sometimes appeared upon the earth in the form of ghosts, particularly on the 30th of August, 4th of October, and 7th of November; whence the Romans considered these unlucky days. The superstitious notion that the spirits of the departed had an important influence on the good or bad fortune of the living, especially of those with whom they had been formerly connected, produced a general fear of them, and made people very cautious of offending them. As they were supposed to persecute those who disturbed their remains tombs were held sacred, and victims (*inferiæ*) and libations offered to the manes. The occasion on which these sacrifices were offered up to the manes of a deceased person might either be peculiar to a certain family, in which case the celebration was called *feriæ denicales*, or a general one. There was only one general festival in honour of the manes every year, namely on the 19th of February. This was called the Feralia or Parentalia. When it was not known whether a corpse had been buried or not a cenotaph was erected, and the manes were solemnly invited to rest there, from fear that otherwise they would wander about the world terrifying the living, and seeking the body which they had once inhabited. It was also supposed that they delighted in blood; various animals were, therefore slain upon the funeral piles—particularly those of which the deceased had been fond during his life—and burned with the body.

MANES, founder of the sect of Manichæans. See MANICHEES.

MANETHO, an Egyptian priest, who belonged to the town of Sebennytus in Lower Egypt, and lived in the reign of Ptolemy Soter, about the beginning of the third century B.C. This is the Latin form of the name, and the Greek is *Manethōs* or *Manethōn;* but the true Egyptian form must have been *Manethoth*, that is, 'given of Thoth.' He was the first who wrote a history of his native country, and an account of the Egyptian religion, in the Greek language. His history was based on ancient Egyptian documents, and more especially on the sacred books of the Egyptians. It was divided into three books, the first of which gave the fabulous or mythological history of Egypt previous to the thirty dynasties, along with the history of the first eleven dynasties; the second, that of the eight following dynasties; and the third, that of the remaining eleven dynasties from the twentieth to the thirtieth inclusive, ending with the reign of Nectanebus, the last of the native Egyptian kings. The period embraced by the pre-dynastic history was calculated by Manetho himself at 24,900 years, and that of the thirty dynasties at 3555 years. The history of Manetho is lost, but the lists of the dynasties are preserved in Julius Africanus and Eusebius, and some fragments of the work are to be found in Josephus in his work against Apion. The work of Manetho's on the religion of the Egyptians was entitled Tōn Physikōn Epitomē. It is also lost. The only work bearing the name of Manetho which has come down to us is an astrological poem entitled Apotelesmatika, and it is spurious.

MANFREDONIA, a seaport town in Naples in the province of Foggia, on the gulf of same name, at the foot of Mount Gargano, 22 miles north-east of Foggia. It is surrounded by walls flanked with bastions, defended by a strong castle, and built with remarkable symmetry. It originally occupied a site about 1 mile south-west, and was called Sipontum. Here the cathedral, a small Gothic structure with a handsome portico, still stands. The harbour, sheltered by a mole, is too shallow to admit large vessels, but a considerable trade is carried on in fruit, corn, and salt. The new town was founded by Manfred, son of the Emperor Frederick II. Pop. 7172.

MANGALORE, a seaport town and fortress in Hindustan, on the Malabar coast, in the province of Canara. It is large and well built, and stands on the edge of a fine salt-water lake which communicates with a river. The port will not admit of vessels drawing more than 10 feet of water, except in spring-tides; but there is good anchorage off the mouth of the river, in 5 to 7 fathoms. The exports are principally rice, pepper, sandal-wood, cassia, and turmeric; the imports sugar, salt, and piece-goods. The inhabitants are chiefly Mapillas or Moplas, said to be descended from a colony of Arabs. A treaty between the British government and Tippoo Saib providing for the mutual restoration of conquests was signed here in 1784. Pop. 30,000.

MANGANESE. The ores of manganese, especially the black oxide, have been long known; for a considerable period they were not, however, distinguished from those of iron; Scheele, in 1774, first distinctly pointed out that the metal contained in these ores possessed properties peculiar to itself. The forms in which manganese generally occurs in the earth are oxide, sulphide, carbonate, silicate, and titanate; it is also found in minute quantities in the bones and blood of certain animals, and in the ashes of plants.

The chief naturally occurring oxides of manganese are:—

(1) *Hausmannite*, or manganoso-manganic oxide (Mn_3O_4), which is found associated with porphyry near Ilmenau in Thuringia, and near Thlefeld in the Hartz. This mineral crystallizes in acute quadratic pyramids, in which the principal is to the secondary axis as 1·175 : 1. It also forms twin crystals, with the face of combination parallel to $P\infty$. The hardness varies from 5 to 5·5; the specific gravity = 4·722. Colour brownish-black. Fracture uneven. Infusible before the blowpipe.

(2) *Braunite*, or manganic oxide (Mn_2O_3). This dark, brownish-black mineral is found in the Hartz, near Ilmenau in Thuringia, in Piedmont, in India,

and in Vermont, United States. The crystalline form of braunite is that of an obtuse quadratic pyramid, in which the principal is to the secondary axis as 0·985 : 1. Hardness 6 to 6·5. Fracture uneven. Brittle. Infusible before the blowpipe.

(3) *Manganite, gray manganese ore,* or hydrated manganic oxide ($Mn_2O_3.H_2O$). This mineral occurs, in addition to the localities already mentioned, in Aberdeenshire, in Sweden, and in Norway. The predominant crystalline form of manganite is the trimetric, usually exhibiting the face ∞P with $\infty \breve{P} \frac{3}{2}$, &c., together with $oP : \infty \overline{P}$, or a pyramid $\overline{P}3$, &c. The crystals are often grouped together, they are longitudinally striated. Hardness = 4; specific gravity = 4·2 to 4·4. Colour dark steel-gray to iron-black. Opaque, small splinters sometimes brown by transmitted light. Fracture uneven. Fusible before the blowpipe.

(4) *Pyrolusite, polyanite,* or manganic dioxide (MnO_2). This, a very valuable ore of manganese, is extensively worked in Thuringia and in Moravia; it is also found in Devonshire and in the United States. Pyrolusite occurs in trimetric crystals, exhibiting the combinations $\infty \breve{P} \infty . \infty P . \infty \breve{P} \infty . oP . \frac{1}{4} \breve{P} \infty$. Hardness = 2 to 2·5; specific gravity = 4·8 to 4·97. Colour iron-black, sometimes bluish. Opaque, rather brittle. Infusible alone before the blowpipe.

Besides these there are several other naturally occurring oxides of manganese, most of which, however, are not of so definite a composition as those enumerated. A mixture of manganese oxides with lime, silica, alumina, and water is known as *black wad.*

Manganese blende, alabandine, or manganous sulphide (MnS), occurs in Transylvania, sometimes crystallized in cubes and regular octahedra, but more generally granularly massive. Hardness = 3·5 to 4; specific gravity = 3·95 to 4·8. Colour iron-black, changing to brown on exposure. Fracture conchoidal. Before the blowpipe it melts only on the thinnest edges.

Red manganese, brown spar, diallogite, or manganous carbonate ($MnCO_3$), is found in Saxony, Transylvania, the Hartz, in county Clare, Ireland, and in Connecticut, United States. The crystalline form generally assumed by this mineral is that of the rhombohedron, in which the principal is to the secondary axis as 0·8117 : 1. Specific gravity = 3·4 to 3·6; hardness 4 to 4·5.

Metallic manganese is obtained by reduction of the oxide by means of heat and finely-divided carbon. The oxide, in a finely-divided state, is mixed with oil, the mixture ignited, and the residue made up into a firm mass by kneading with a little oil. This paste is introduced into a crucible lined with a mixture of plumbago and fire-clay, which is filled up with charcoal powder, and then exposed for an hour and a half to the highest heat which can be obtained from an air-furnace without fusing the crucible itself. The metal, which is found in the form of a button, is refined by remelting it in a closed crucible, along with a little manganese carbonate. As thus prepared manganese is a grayish-white metal, very soft and brittle, with a fine-grained structure. It oxidizes quickly in the air, and must therefore be kept under rock-oil or in sealed tubes. Metallic manganese is feebly magnetic; it decomposes water slowly at ordinary temperatures; in hydrochloric or dilute sulphuric acid it is easily soluble; its specific gravity is 8·013 (Deville). The atomic weight of manganese is 55.

The alloys of manganese are not of much importance; it may be combined with cobalt, copper, nickel, gold, iron, aluminium, and mercury.

Manganese ores, especially its dioxide, are so much used in manufacturing operations, it is important that we should have a quick and accurate means of estimating their value. The value of a manganese ore is dependent upon the quantity of oxygen evolved from it by the action of acids, or the quantity of chlorine obtained by acting on it with hydrochloric acid. Two methods of estimation are therefore available:—(1) To expose a known weight of an easily oxidized substance to the action of the ore, and then to determine the amount of this substance which remains unacted upon; or (2) To evolve chlorine from hydrochloric acid by means of the manganese, and determine the amount of chlorine so evolved by suitable means.

The first of these methods is generally carried out by acting on a known quantity of oxalic acid, in the presence of sulphuric acid, by means of a weighed amount of the ore, whereby the oxalic acid is broken up into water and carbon dioxide, and finally determining the amount of oxalic acid which remains unacted upon by means of potassium permanganate. The second method is carried out by leading the evolved chlorine into a solution of potassium iodide, and then determining the amount of iodine set free by means of a solution of sodium thiosulphate.

Many other modifications of these two methods are in use.

MANGANESE, SALTS OF.

A. *Oxides.* The oxides of manganese are four in number:—

Manganous oxide (MnO).
Manganoso-manganic oxide (Mn_3O_4).
Manganic oxide (Mn_2O_3).
Manganic dioxide (MnO_2).

(1.) *Manganous oxide* (MnO), is prepared by heating to fusion a mixture of equal parts of manganous chloride and sodium carbonate, with a little sal-ammoniac, and exhausting the fused mass with water, forms a grayish-green powder, which melts at a high temperature to a green-coloured mass. This oxide may also be obtained in emerald-green octahedra, with adamantine lustre, by heating the powdered oxide in hydrogen mixed with a very little hydrochloric acid gas. It is not deoxidized by any heat.

(2.) *Manganoso-manganic oxide* ($Mn_3O_4 = MnO.Mn_2O_3$). By igniting manganous oxide, nitrate, or carbonate, or by very strong ignition of either of the higher oxides, this oxide is obtained. Manganese, when oxidized either slowly in moist air, more rapidly at higher temperatures, or by ignition in oxygen gas, likewise yields manganoso-manganic oxide. This oxide forms a reddish-brown cinnamon-coloured powder, which turns black when heated, but receives its original colour when cool.

(3.) *Manganic oxide* (Mn_2O_3). Hydrated manganic oxide may be prepared by passing chlorine through manganous carbonate suspended in water, and digesting the solid residue with very dilute nitric acid; or by precipitating a manganous salt by means of caustic potash, and allowing the precipitate to stand for some time in the air. If the hydrate prepared by either of these methods be heated to low redness the water is driven off, and manganic oxide remains as a black powder. If this oxide be strongly ignited it gives off oxygen and leaves manganoso-manganic oxide, as we have already learned; on the other hand, when this latter oxide is heated in oxygen at a high tension it unites with it to form manganic oxide; indeed it appears that generally the product obtained by heating an oxide of manganese is dependent not only on the temperature employed, but also on the tension of the surrounding oxygen.

(4.) *Manganic dioxide* (MnO_2) may be prepared by heating manganous carbonate to 260° in an open vessel, and removing undecomposed carbonate by means

of the upper extremities, and in the movements of prehension, rotation and supination, the anterior limbs of the Apes resemble those of man. The lower limbs of man, devoted solely to locomotion, exhibit marked differences from the corresponding members in all other mammals. In man the lower limbs are relatively longer than in most other mammals, and the segment of the limb which exhibits the greatest relative length is the thigh. In man, therefore, the arms reach only to the middle of the thigh, whilst in the higher Apes they extend to the knees or even to the ankles. The human foot, no less than the human hand, is characteristic of man. Man is distinctly *plantigrade*, that is, walks on the whole sole of his foot. The great-toe is not adapted for prehension, and is thus unopposable to the other digits. The foot itself is doubly arched, from side to side, as well as from behind forwards—a conformation giving to the human step its well-known elasticity. The plane of the human foot lies at right angles to the leg. The weight of the body falls upon the arch, supported by the heel-bone behind and by the metatarsal bones in front. The placing of the heel firmly upon the ground is natural to man only; the heel in the higher Apes touches the ground only partially; and in lower mammals the heel is generally raised off the ground; the animals being *digitigrade*, that is, walking more or less upon the tips of the toes. In the Apes the foot becomes more or less modified to form a prehensile organ; the great-toe is capable of extensive movement, and the animals thus become 'quadrumanous' in the truest sense of the term.

The muscular arrangements of the human trunk and limbs exhibit features highly characteristic of man's structure and economy. The *glutæi*, or hip-muscles, arising from the broad and expanded ilia or pelvic bones, thus keep the trunk erect and fixed upon the thigh-bones, and are of larger size than in other mammals. The muscles (*extensors*) which extend the legs upon the thighs are more powerful than the opposing or *flexor* muscles; and the muscles of the 'calf,' which keep the leg straight or erect upon the foot, are more largely developed in man than in the highest apes. The muscles of the head and neck, combining to keep the head and spine erect, also partake of an especial development. The *brain* of man differs from that of the highest apes in its great absolute size, measuring from 55 to 115 cubic inches. Its mass is thus larger in proportion to the body than in any ape, and the cranial nerves also present the same distinctive feature. The convolutions of man's brain are more numerous and complex and are less symmetrically disposed than in the apes. The cerebral hemispheres of man are relatively larger when compared with the cerebral nerves and with the cerebellum or lesser brain than in apes; and the posterior lobes of the cerebrum project behind the cerebellum to a much greater extent than in any of the Quadrumana. The gray matter of the brain, lying to its peripheral or external border, is said to be thicker in man than in the apes; and the *corpus callosum*, or great transverse band uniting the cerebral hemispheres, extends further backwards in man than in Quadrumana. The *senses* of man are present in great perfection, and attain, through their guidance by the intelligent will, a generally higher development than in other animal forms. The human body does not possess a perfect covering of hair, this being most abundant on the head, under the armpits, on the pubis, and on the front of the chest. The gorilla in its entire structure presents of all the apes the nearest approach to the human type taken also in its entirety; but there are other apes to be presently noted which approach more nearly to man when individual or special parts and structures are selected for comparison. The gorilla itself is most anthropoid in the curvature of the spine, in the general form of the pelvis, and in the large size of the heel. The proportions of the leg to the foot, and those of the foot to the hand, also approach most nearly to those found in man; and lastly, in the absolute capacity of the brain-case the gorilla of all the apes is most man-like. The gorilla, taken all in all, is thus structurally nearer to man than the baboons and lower apes are to the gorilla. The chief differences observable in the gorilla's structure when compared with the human type are in the relative number of vertebræ; the gorilla possessing thirteen dorsal and four lumbar segments, whilst man has only twelve dorsal and five lumbar. The presence of the characteristic interval or diastema in the teeth of the monkeys, and its absence in man, has already been alluded to. In the gorilla this gap exists in front of the upper and behind the lower canine teeth. The second and third molar teeth of the gorilla precede the canines in order of succession or development—this being different to the order of dental succession in man. The buttocks and calves of the gorilla are not nearly so prominent as in man, these muscular developments, as already explained, having reference to the maintenance of man's erect position. The orangs most closely approach man's structure in the number of ribs and in the form of the cerebrum; whilst they exhibit the greatest differences from him in the relative length of the limbs. The chimpanzees are most anthropoid in the shape of the cranium, in the arrangement and succession of the teeth, and in the length of the arms as compared with that of the legs. Of the higher apes the gibbons are those furthest removed from the human type of structure. (See the figures of skeletons and skulls in Pl. IV. VI.–VII.) The mental endowments of man, as already remarked, place him on a platform widely different, and separated by an illimitable gulf from all purely structural considerations. Chief among the psychical features, or rather among the results of the operation of the principle of *mind*, we note the possession of the moral *sense of right and wrong*, from which proceed the principles of ethics and of religion, and the acknowledgment of man's relations with his Creator. The possession of an articulate language, by which he can communicate his thoughts, is also the exclusive possession of man, and draws a sharp line of separation between him and all other animals. Difficult as it is to rightly estimate the *essentials* of man's psychical endowments, it appears that no condition of men is destitute of the elementary features of mind and of moral responsibility—features these which the influences of civilization tend to elevate into the highest qualities with which the Creator has seen fit to endow his creatures.

The geological history of man is one which has always been fraught with great interest, and concerning which much discussion has existed. Dealing as it does with the probable period of man's appearance upon the earth, and connecting us thus with man's early history—a history unwritten save in traces of his handiwork and habitations—the palæontology of the human race becomes inseparably linked with the first elements of religious belief, and with those traditions and tenets which the Christian religion has made peculiarly its own. It is not surprising, therefore, that the discussion of this subject has in some measure led to much discord between theology and geology; but leaving theology and its tenets out of the question, and working simply as scientific inquirers, geologists have found good grounds for insisting upon our recognition of man's advent upon this earth at a period much anterior to that which former limits and theological ideas prescribed.

The earliest traces of man which the palæontologist has yet discovered belong to the later post-tertiary, or quaternary period of geology. Traces of his handiwork in the form of rude implements abound in the superficial deposits of this period, and especially in the cave deposits. An attempt has been made to classify the relative ages of man in geological times by the nature of the implements found in the various deposits. Thus the rudest and most primitive age is known as the *stone age*, and is characterized by the presence of stone implements, evincing the first beginnings of man's efforts to assist himself in his daily operations by the manufacture and use of tools and appliances. Succeeding the stone age we find the *age of bronze*, and lastly comes the *age of iron;* this latter period indicating a great advance over the stone age, and necessitating the lapse of a vast period of time since that age; for man does not quickly advance from the ways of the rude savage to that of the semi-civilized worker in metals. Palæontologists have recognized the stone age itself as one of great extent, and including a lengthened period of time; and to the early stone period, with its ruder implements, the term *Palæolithic* (Lubbock) has been given; whilst the newer stone period, with its more elegant tools and weapons, has been named the *Neolithic* period. To the Palæolithic period belong the deposits in caves (for example, the Kirkdale Cave in Yorkshire), in which the *fera* or wild animals of the district lived, or in which they died. Cave deposits yield a rich harvest of such remains, bearing evidence of man's presence and proximity from the gnawed appearance of the bones, and from the discovery of flint implements and the traces of fire. The animals which in all probability were thus contemporaneous with man, include the cave hyæna, cave bear, wolf, and fox, mammoth, woolly rhinoceros, hippopotamus, reindeer, Irish elk, &c. The great age of such deposits may be judged from the great change of fauna which has resulted in the extermination of some of these animals and the limitation of others to warmer regions of the earth; and also from the length of time required for the covering of these remains by a thick stalagmitic or limy deposit such as in some cases has been found in the caves. Besides cave deposits, the former levels (higher valley gravels) of rivers, with their alluvial deposits, also contain man's rude implements, associated with the remains of extinct mammals; and in the North of France and South of England particularly, the gravel deposits have yielded a rich harvest of flint implements and animal remains, the latter being those of mammals many of which (for example, lion, hyæna, mammoth, &c.) have long since become extinct in Britain and Europe generally. To the *neolithic* or newer stone period belong the *lake-dwellings* or *pfahlbauten* of Switzerland—ancient dwellings built on piles driven into the shallower waters of Swiss lakes, and which are known where they occur in Scotland and Ireland as *crannogs*. (See LAKE-DWELLINGS.) These lake-dwellings must have possessed a wide range in time, the older of them yielding stone, and the newer, bronze implements and fragments of rude pottery and cloth. The Danish *peat-mosses*, with their extinct—so far as Denmark is concerned—trees, the Scotch fir and oak, and their contemporaneous stone and bronze implements; and the *kitchen-middens* or *Kjökkenmoddings* of the same country, consisting of large collections of the shells of cockles, oysters, &c., with their included *stone* and horn implements, belong to the neolithic period. And succeeding such deposits the bronze and iron age bring us to still more recent and superficial formations, and to the domain of the archæologist, and through this latter to historic times. In the later deposits man's remains and implements become associated with the remains of living Mammalia. The researches of geologists, it must however be noted, have almost entirely been confined to the deposits of Europe. The formations of Asia, in which continent man must have enjoyed a state of civilization whilst the early inhabitants of Europe were comparative savages, have yet to be fully investigated; and there can be no doubt but that the East is the region to which geology, archæology, and history point as that in which the earliest beginnings of human existence are to be found—if indeed they may be traced at all. And for the rise from savage life to civilization: for the progress from the rude sculptures of the stone age to those of architecture which even we deem ancient; and for the elevation of man from the condition of a higher brute to that of an intelligent responsible being, what immense periods of time are demanded and required! Such is the obvious conclusion to which calm and patient investigation leads, and such are the problems which the study of man in his geological relations involves.

MAN, ISLE OF (Latin, *Mona* or *Monavia*), an island in the Irish Sea, about 31 miles from England, 32 miles from Ireland, and 18 miles south of Scotland. The extreme length, north-east to south-west, is about 30 miles, with an irregular breadth of about 12 miles at most; area, 145,325 acres, including the island Calf of Man at the south-western extremity of Man. Viewed from a distance, the general aspect of the island, though in some respects beautiful, is rather tame, for the hills, which extend nearly through its entire length, although of considerable altitude, neither tower up with sufficient abruptness nor assume picturesque forms. The highest point is Snaefell or Sneafell, about 2024 feet high. This range of hills, which occupies a considerable portion of the surface, is chiefly composed of clay-slate, containing some beds of roofing slate. Veins containing ores of lead, zinc, copper, and iron intersect the mountains in a northerly and southerly direction. The lead mines produced in 1881, 4183 tons of lead and 84,860 oz. of silver; the zinc mines, 3180 tons. The island is well watered, numerous springs and rivulets issuing from the hills. The northern district of the island is not so fertile as the southern, where land rents at 60*s.* and upwards the acre, but timber is more abundant in the former. The poorest land is in the middle. Agriculture has improved in recent years, but is still somewhat backward. The grain crops covered 25,211 acres in 1882, the green crops 12,046. The climate is salubrious and free from extremes of temperature; the mean of the year being 49° 50'. The greater portion of the island is in the possession of yeomen farming their own little estates, consisting of from 10 to 200 acres, and possessing mostly a portion of lowland with hill-pasture. The manufactures are almost entirely domestic. The herring-fishery is an important industry, there being more than 400 boats of 25 or 30 tons and upwards engaged in it. Agricultural produce is exported. The island has for some time been a favourite resort for summer visitors.

The government, political institutions, and laws of the Isle of Man are in many respects peculiar. The legislative authority is vested in the governor, council, and House of Keys—the last formerly a self-elected body of twenty-four individuals, but since 1866 elected by the people. The governor is chancellor and judge in all the superior courts. Two *deemsters*, officers of great antiquity, preside in their own summary courts, and have very extensive civil jurisdiction, and minor criminal cases likewise come before them; they also sit as the governor's assessors in the chancery and other superior courts. The

governor is appointed by the crown. The council consists of eight members; the Bishop of Sodor and Man being the senior member. The governor, council, and keys constitute the parliament or *Tynwald Court* of the island. No measure can be passed save with the governor's consent; the royal assent is likewise necessary to all acts of Tynwald, and no law comes into operation until it has been promulgated upon Tynwald Mount. The island is divided into six districts called *sheadings*, and these again are subdivided into seventeen parishes. Since 1866 the insular exchequer has received the whole surplus customs revenue after the payment of all expenses of government, and £10,000 a year contribution towards the imperial exchequer. It likewise receives from various sources, including royalties and minerals upwards of £12,000 a year. The surplus customs revenue has been sufficient to enable the insular government to construct large harbour works, including a deep water landing pier at Douglas. Upwards of a quarter of a million has been expended on these and other public works. One result of these improvements has been that within the last few years the number of summer visitors to the island has increased from 50,000 or 60,000 to upwards of 120,000. The established religion is that of the Church of England, under the Bishop of Sodor and Man, who has a seat without a vote in the House of Lords. The Manx language, a Celtic dialect, is still in use, although all the inhabitants speak English. The principal towns are Castletown, Douglas, Peel, and Ramsey. There are railways from Douglas to Peel on the opposite side of the island, and to Port Erin in the south-west. In 1882 415,939 tons of shipping entered, and 412,891 tons cleared at the ports of the Isle of Man. Pop. in 1881, 54,089.

This island was originally peopled by the Manx (*Menarii*), a Celtic tribe. It was conquered by Edwin, king of Northumbria, about 614, was taken by the Norwegians in 1098, sold to the Scots in 1266, and was repeatedly occupied by the English and Scots up till 1344, when it remained in possession of the former. It was latterly held as a feudal sovereignty by the earls of Derby, and more recently by the dukes of Athole, from whom it was purchased for the British crown in 1764 for £70,000; and finally, in 1829, certain remaining privileges were ceded by the duke on receiving an award of £416,000.

MANAAR, GULF OF, is the tract of sea lying between the Island of Ceylon and the east coast of the southern extremity of Hindustan, being separated from Palk's Strait by a long line of sandbanks called Adam's Bridge, which runs between the two islands of Manaar and Ramisseram. The gulf is about 130 miles wide at the broadest part, but is so full of sandbanks and shoals as to render its navigation difficult, if not impossible, by vessels of large burden. It possesses many extensive fisheries, and abounds in pearl banks and chank-shells.

MANACOR, a town of Spain, on the Island of Majorca, 30 miles east of Palma, on a gentle declivity. It is well built; has several spacious squares, and wide, well-kept streets. Its buildings are substantial; the most important are the palace of the ancient kings of the country, a large parish church, a chapel of ease, town-house, prison, two schools, and an hospital. It has also manufactures of brandy, wine, oil, and verdigris; and some trade in grain, oil, cattle, sheep, and fruit. Pop. 14,894.

MANAGUA, a town in Central America, capital of the state of Nicaragua, near the south-west shore of the lake of same name, 32 miles S.S.W. of Leon. It consists of long rows of huts, and a large square lined with houses of two stories. The centre of the square is occupied by a large church, and there is another large church with a conspicuous white arched portal. The inhabitants, chiefly Indians, are very industrious, and show great dexterity in imitating articles of foreign manufacture. Pop. about 12,000. The *lake*, about 38 miles long, discharges itself into that of Nicaragua, above which it has an elevation of 16 feet, while its elevation above the Pacific is 156 feet. It has attracted a good deal of attention in consequence of its supposed capability to form part of a proposed navigable communication between the Atlantic and Pacific.

MANAKIN (*Pipra*), a genus of Dentirostral birds included in the order Insessores or Perchers. These birds, generally of small size, inhabit tropical America, and like most other birds of that region, exhibit a singular beauty of plumage. They are gregarious in habits, lithe and active in their movements, and feed on insects and fruits. The bill is somewhat compressed, being broad at its base, and possessing the tip or apex greatly curved. The tail is short, or at most of moderate length. The tarsus is elongated, the feet being short, and the outer toes partly united to the middle digits. The nasal fossæ are of large size, and the nostrils themselves are generally covered by the plumage of the head. The *Pipra militaris* possesses a frontal crest or plume of bright red feathers, and is a familiar species of these birds, besides being one of the largest members of the genus. The back is coloured deep-blue, and the rest of the plumage is jet black. The only true manakin inhabiting a different region from South America is the *Calyptomena viridis*, found in Sumatra. The plumage of this form is of a green colour, closely resembling that of the leaves amid which it perches. Nearly allied to the manakins is the *Rupicola aurantia*, the 'Cock of the Rock,' which attains the size of a pigeon, and possesses a double crest of feathers which meet in the middle and form a fan-like appendage to the head. The tail-coverts are also long and curved, and thus constitute a cock-like tail. The plumage is orange-coloured, the wing-quills and tail being black. It inhabits Guiana, and makes its nest in the crevices of rocks. These birds appear to live on fruits, and to resemble the Rasorial birds in their scratching habits as well as in general appearance. A Peruvian species has also been described under the name of the *Rupicola Peruviana*. (See Pl. CXLII.-CXLIII. fig. 2.)

MANASAROWARA, a lake of Tibet, among the Himálaya Mountains, is one of the most venerated of all the places of pilgrimage resorted to by the Hindus, who visit it in great numbers in spite of all the difficulties of the journey. The Tibetans also hold it in great reverence, and come from great distances to throw into it the ashes of their friends. It is about 15 miles long and 11 broad, and with its borders of lofty crags, and its towering barrier of snow-capped mountains, forms a magnificent scene. Its shores are covered with monastic houses.

MANASSEH, eldest son of Joseph, born in Egypt. When brought with Ephraim to receive the blessing of his grandfather Jacob, the old man placed his right hand upon the head of the younger, and his left upon that of Manasseh, thus depriving the latter of the precedence due to his priority of birth. The descendants of Manasseh formed a tribe, which, in the Promised Land, was settled half beyond the Jordan, and half in the territory of Samaria, Sichem, and Bethany.

MANATEE (*Manatus*), an aquatic mammal included in the order Sirenia, and formerly classified with the Cetacea or Whales, from which, however, it is structurally distinct and separate, being more nearly allied to the Ungulata or hoofed quadrupeds. The body is somewhat fish-like in general conforma-

sure. It is also applied to any proclamation made by a prince at the commencement of any enterprise. The name is taken from the words *manifestum est*, &c. (it is manifest), the beginning of these declarations, as they were anciently written in Latin. Manifestoes are in the form of public letters: they commence with a short address to the public in general, and are signed with the name of the sovereign who issues them.

MANILA, the capital city of the island of Luzon and of all the Philippine Islands, see of the Roman Catholic primate, and one of the great emporiums of the East, lies on the bay of the same name, and at the mouth of the river Pasig, here crossed by a bridge, as far as which vessels of some hundred tons burden may ascend. The city proper forms the segment of a circle on the south side of the river, between it and the sea, and its suburbs extend over numerous islets formed by the river and its branches, and easily reached in all parts by boats. It has a dilapidated look, but is strongly fortified with walls and ditches. On the north stands the Binondo suburb, more populous than the city itself; the residence of the foreign merchants and the great centre of trade. The aspect of the whole is at once Spanish and oriental; long lines of heavily-mounted batteries, sombre churches, and ungainly towers and massive houses of solid masonry, mingle with airy cottages in groves of tropical trees, raised on posts to permit the free passage of the waters in the rainy season, and so constructed as, by their elasticity, to stand the shocks of an earthquake. In the windows small squares of semi-transparent shell are substituted for glass, and temper the intense light of the sun. By law the Chinese ought to be dispersed over the country to till the ground, yet many of the merchants and shopkeepers, and all the artisans, are of that nation. The environs of Manila are beautiful and picturesque. Being the only port in the Philippines open to foreign vessels, Manila is the centre to which all their productions flow, and the resort of an infinite number of vessels of all sorts and sizes. It exports sugar, tobacco, indigo, Manila hemp and cordage, gold-dust, birds'-nests, coffee, sappan-wood, mats, and hats, hides, trepang, tortoise-shell, cotton, rice, and coined money; total estimated value of exports in 1882, £2,800,000. It imports British and United States cloths, hardware, &c., and a great variety of articles, tea, pottery, &c., from China; total estimated value of imports, £5,400,000. In 1881 the number of vessels that entered the port of Manila was 316, of 244,231 tons burden. Of these 118, of 87,008 tons, were British; 95, of 67,094 tons, Spanish; while 34,901 tons were American. The manufactures consist chiefly of cigars and cheroots, a government monopoly, which gives employment to several thousands both of men and woman; of cordage from the filament of the abaca (see ABACA); the beautiful fabrics called *piñas*, woven from the fibres of the pine-apple leaf, and afterwards exquisitely embroidered; various cloths made of the abaca filament; pure or mixed cotton fabrics; mats and cigar-cases. The Tagals are ingenious workers in metals and wood; notwithstanding the inferiority of their tools they are excellent cabinet-makers and ship-builders.

Manila was founded by Miguel Lopez de Legaspé, the conqueror of the Philippine Islands, in 1571. In 1717 the zeal of a governor in repressing abuses led to the murder of himself and his son in an insurrection. In 1762 it was taken by a British fleet, and held for fifteen months. In 1809 an English house was permitted to establish itself there, a privilege extended in 1814 to all foreigners. A tribunal of commerce was established in 1864 and a board of trade in 1835. It has frequently been visited by severe and destructive earthquakes. The most disastrous were those of 1645, 1796, 1824, 1852, and 1863. Pop., including suburbs, estimated at from 250,000 to 300,000.

MANIOC, another name for CASSAVA (which see).

MANISA, or MANSER (anciently *Magnesia*), a town in Asiatic Turkey, near the left bank of the Gediz-chai (Hermus), 30 miles north-east of Smyrna. It has considerable manufactures of cotton and silk goods, and goat's-hair shawls. The mountains of the district were long famous for magnetic iron, and the name of *magnet* given to the loadstone is supposed to be derived from that of the town. At the ancient Magnesia, Antiochus the Great of Syria was defeated by the Romans in 190 B.C. Pop. estimated at 60,000.

MANITOBA, a province of the Dominion of Canada, bounded on the south by the United States, on the west, north, and east by the North-west Territories of the Canadian Dominion. It extends from 49° to 52° 50′ N. lat.; and from 89° to 101° 20′ W. lon.; and comprises an area of 123,200 square miles, or a little above that of the British Islands. The name is a contraction of two Cree words, Manitowaban, meaning 'the spirit's strait,' and was originally applied to the lake still so called on account of a peculiar agitation of the waters of a strait in that lake. The greater part of the province consists of somewhat level and monotonous prairie land, with treeless plains varying from 5 to 40 miles in extent, and covered with a rich vegetable growth in summer. The banks of the rivers are, however, lined with a timber belt extending from about half a mile to ten miles back from either bank. The principal trees here are the elm, the oak, the ash-leaved maple, the poplar, the aspen, and numerous varieties of willow. The indigenous fruits include the strawberry, currant, raspberry, plum, cherry, cranberry, &c. The soil is a rich black mould, resting partly on a limestone formation, and partly on a thick coat of hard clay. Wheat, oats, barley, Indian-corn, hops, flax, hemp, and all kinds of garden vegetables ripen early. For wheat growing it presents peculiar advantages. When compared with the best wheat-growing districts of the United States, the soil of Manitoba (as well as that of the territory already settled further to the west and north-west) is found to produce on an average both a greater number of bushels to the acre and a greater weight to the bushel. Thirty bushels to the acre is stated to be the average crop in Manitoba, while in South Minnesota it is 20 bushels, in Pennsylvania and Ohio 15, and in Wisconsin only 14; and while spring-wheat in Manitoba weighs from 65 to 66 lbs. to the bushel, that of Minnesota weighs only from 60 to 65 lbs., and that of Ohio and Pennsylvania no more than from 57 to 60 lbs. Potatoes and all other root-crops thrive well, and the prairie grasses furnish good hay. The grassy savannas of the Red River afford unlimited pasture ranges. A good deal of cattle of approved breeds has been introduced, and it is more than probable that stock-raising will in the near future be among the most remunerative pursuits. The wild animals include the buffalo, cariboo, moose, elk, deer, and antelope; prairie chicken, duck of all kinds, wild geese, crane, snipe, swan, partridge, pheasants, pigeons, &c., are found, and the rivers and lake teem with fish; the mosquito is very troublesome near swampy ground or on the unreclaimed prairie. Coal of a fair quality has been recently found in almost inexhaustible quantities in various localities. The climate, though very severe in winter, is nevertheless occasionally hot in summer. Harvest extends from about the middle of August

to about the end of September, during which period the weather is very agreeable. The principal rivers are the Assiniboine, 480 miles long, and Red River, 665 miles long, 525 of which are in the United States. The largest lakes are Winnipeg and Manitoba, and they are only partially included within the boundaries of the province. Manitoba is divided into five electoral districts for Dominion elections, each sending one member to the House of Commons. The province likewise sends three members to the Senate of the Dominion. The public affairs are administered by a lieutenant-governor, an executive council of five members, and a legislative assembly of thirty-one members elected for four years. The school system established by law is entirely denominational. The government has set apart two sections or 120 acres of land in each township, the proceeds of which, when sold, are applied to the establishment of schools, and the grants of money are equally divided according to the number of children in each section, as ascertained by annual census. As fast as settlement progresses, schools are established, and as teachers have to pass a rigid examination before they are appointed the education of the children is generally of a high class. At the head of the educational establishments stands the Manitoba University, which is an examining and degree-conferring body, affiliated to which are the Episcopal, Presbyterian, and Roman Catholic Colleges. Every settler in the province receives a homestead or grant of 160 acres of land. The capital of the province is Winnipeg, situated at the junction of the Assiniboine and Red Rivers. The nucleus of the province consists of the territory purchased from the Hudson's Bay Company in 1811 by the Earl of Selkirk, who planted a colony there in 1812. This region was repurchased in 1836 by the Company from the heirs of Lord Selkirk, and, after the transfer of their territory to Canada, was admitted as a province of the Dominion in 1870, the district at that time having an area of about 14,000 square miles, with a population of over 12,000, mainly of Indian half-breeds. In 1881 the boundaries were widened to the extent indicated at the beginning of this article. In recent years much has been done to draw attention to the natural advantages offered by Manitoba to settlers, and to increase these advantages by improving the communications. The trade of the province has been greatly increased since 1878, when Winnipeg was connected with the railway system of the United States; and the construction of the Canadian Pacific Railway, which crosses the province from east to west, has added materially to the progress and prosperity of the country. Population according to census of 1881, 65,954; estimated at end of 1882, 135,000; and in October, 1883, 165,000.

MANNA. This substance, which is so frequently employed in the *materia medica*, and which forms a considerable article of commerce, exudes naturally or from incisions made in the trunk and branches of a species of ash (*Ornus rotundifolia*). It first appears as a whitish juice, thickens on being exposed to the air, and when dried forms a whitish or reddish granular substance, which is the manna of commerce. The tree is a native of Italy, and is cultivated extensively in Sicily. June and July are the two months in which the manna is collected. It is detached from the trees with wooden knives, and is afterwards exposed to the sun for drying. A little rain, or even a thick fog, will often occasion the loss of the collections of a whole day. The taste of manna is sweet, and slightly nauseous. It is a mild purgative, and is principally administered to children. The *Fraxinus virgata* also yields manna, but it cannot be obtained from any other species of Ornus.

The finest kind of manna is called *flake manna;* it is white or yellowish-white in colour, light, porous, and friable. *Sicilian manna* is of very common occurrence in commerce; it is generally found in small, soft, round fragments; its colour is yellowish-brown, and it is generally mixed with more or less impurities. There are many other saccharine juices known by the name of manna; one of these, which exudes from the *Tamarix mannifera*, is by some believed to be the manna mentioned in the Bible. This tree grows plentifully in the neighbourhood of Mount Sinai, and is often punctured by an insect which inhabits it, whereupon the manna exudes as a thick transparent syrup. This manna is gathered early in the morning, when it has partially congealed owing to the coolness of the night; it is eaten in Palestine as a delicacy. The essential ingredient of manna is called *mannite*. Of this substance manna contains from 40 to 60 per cent; the remainder consisting of sugar, 5 to 10 per cent; gummy matter, 2 to 40 per cent; and insoluble matter, water, and ash. On treating manna with boiling alcohol, and allowing the solution to cool, thin four-sided prisms of mannite are deposited. Mannite has been shown to be a hexatomic alcohol, it has the formula $C_6H_{14}O_6$; by oxidation it yields first *mannitic* and then *saccharic acid*.

MANNHEIM. See MANHEIM.

MANOEL, FRANCISCO, the most celebrated lyric poet of modern Portuguese literature, born at Lisbon, 1734; died at Paris, 1819. His talent was first known to foreigners, whom he attended as a *Cicerone* after the earthquake of Lisbon in 1755. His poems are also popular among his countrymen. That on virtue has been generally admired. His enemies, jealous of his reputation, endeavoured to render his opinions suspicious, for which they found means in his expressions concerning toleration and monks, and in his translation of the Tartufe of Molière. Cited before the Inquisition, he disarmed (July 4, 1778) the agent of the holy office, and fled to Paris, where he ever after continued to reside. He translated Wieland's Oberon. His poems, under the title of Versos de Filinto Elysio, fill several volumes (second edition, Paris, 1818–19). His odes and his translation of Lafontaine's Fables are particularly esteemed.

MAN-OF-WAR BIRD. See ALBATROSS.

MANOMETER, or PRESSURE-GAUGE, an instrument for measuring the pressure of a gas. The open-air manometer is a U tube containing a quantity of mercury in the bend; one end is open to the atmosphere, the other communicates with the gas whose pressure is to be measured. We know that the weight of a column of mercury 30 inches long is the pressure of one atmosphere, so that the difference of level of the surfaces of the mercury in the two limbs enables the pressure to be determined. When both limbs are much shorter than before, and one is closed and the other connected with the gas whose pressure is to be measured, the compression of the dry air in the closed limb, together with the difference of level of the surfaces of mercury in the two limbs, enables the pressure to be calculated. Various other forms of pressure-gauge are employed on steam-boilers. Regnault determined pressures less than one atmosphere by means of a modification of the ordinary barometer. See BAROMETER.

MANOR (*manerium*, from *manere*, to remain, because the usual residence of the owner) seems to have been a piece of territory held by a lord or great personage, who occupied a part of it, as much as was necessary for the use of his own immediate family, and granted or leased the remainder to tenants for stipulated rents or services. This was the origin of copyhold estates, viz. those held by copy of the roll of the court of the manor. The portions granted

by royal charter in October, 1838. The management of local affairs is in the hands of sixty-four councillors, who elect from their body sixteen aldermen and a mayor, and appoint committees for the transaction of the various departments of public business, such committees reporting their proceedings for approval at the general meetings of the council. Manchester has a separate commission of the peace and court of quarter-sessions. There is an efficient constabulary force under the control of the watch committee of the council. The council have also under their management the extensive gas-works, from which, notwithstanding that frequent reductions in the price of gas have been made, an annual profit of upwards of £60,000 is realized, which is expended in city improvements. Before the incorporation of the borough Manchester was dependent for its water supply upon wells and pumps. A company was formed to improve this state of affairs, but ultimately the corporation bought it up and constructed works upon a suitable magnitude. Extensive gathering grounds and reservoirs were constructed at Woodhead on the Sheffield route. The cost was upwards of £1,200,000. Further powers have been obtained from Parliament to construct additional water-works at Thirlmere in Westmoreland, estimated to cost £2,000,000.

History.—Manchester was known at a very early period. Details of a speculative nature have been given by some writers as to its pre-Roman condition; but it is certain that on the invasion of Lancashire by Julius Agricola (A.D. 79) a Roman station was founded at Mancunium, which was probably a conversion of a fortress of the Brigantes, said to have been called *Manconion*. At Castlefield urns, votive altars, coins, &c., have been discovered at various periods. After the Romans withdrew, the Saxons, about 488, wrested Mancunium from the Britons, but were again forced to restore it. In 620 it was taken by Edwin, king of Northumbria, and was shortly after occupied by a colony of Angles. About this time the old name of Mancunium seems to have been supplanted by its Saxon form *Manecestre* or *Mamcestre*. The conversion of the inhabitants to Christianity is said to have been effected about 627 by the preaching of Paulinus, and a church dedicated to St. Michael was erected. Manchester next passed to the Danes, who were expelled about 920 by Edward, king of Mercia. This prince repaired the castle, leaving in it a strong garrison, and raised the town from the ruins into which it had fallen while half-barbarous chiefs were contending for its possession. Its charter, conferring the privilege of a borough, was granted in 1301. Manchester cotton is heard of for the first time in 1352; but the article so designated, notwithstanding its identity of name, had nothing in common with the modern fabric, being in fact a woollen cloth of coarse texture woven from the unprepared fleece. At this time the manufacture of broad-cloth was introduced by the Flemings, and made considerable progress. In 1422 the church (now the cathedral) was built and collegiated. The collegiate body, which had for its residence a building at Hunt's Bank, on the site of the old Baron's Hall, was dissolved in the reign of Edward VI., and the building subsequently became the property of the Derby family. It is now the Chetham Library and hospital. During the civil war possession of Manchester was keenly disputed, and the town suffered much at the hands of both parties. About this time it is described as being 1 mile in length, with good streets and buildings, and a very industrious population. Its progress since has been extraordinarily rapid. It has played an important part in the political history of the age, especially in connection with the agitation for parliamentary reform and the establishment of free-trade. The civil war in America led to a cotton-famine, which in 1862 caused the deepest distress in South Lancashire, and called forth help from sympathizers in all parts of the world. The Art Treasures Exhibition in 1857 should also be remembered. Manchester and Salford were enfranchised by the reform act of 1832. Manchester now returns three members to the House of Commons, and Salford two. The population in 1773 amounted only to 26,426; in 1801 it was 106,798; in 1881 the population of the municipal borough was 341,414, parliamentary borough 393,555; the population of Salford was, for the municipal and parliamentary borough (coextensive), 176,235; pop. of both boroughs, and immediately contiguous urban sanitary districts, about 800,000.

MANCHESTER, a town in the United States, New Hampshire, on the Merrimac, at the Amoskeag Falls, and at the terminus of the Merrimac and Connecticut, and the Manchester and Lawrence railways, 59 miles north-north-west of Boston. It is regularly laid out in streets and squares, the former crossing at right angles, and three of the latter with ornamental ponds in their centre. The main street, which is 100 feet wide and above a mile long, is planted on each side with elms. The principal buildings are the town-house, the county court-house, the state reform school, a Roman Catholic convent, an orphan asylum, two opera-houses, the city library, &c. The manufactures, having the advantage of an unlimited supply of water-power from the falls of the Merrimac, are important. The chief articles manufactured are cottons and woollens, locomotive and other engines, edge-tools, castings, scales, and paper. The cottons and woollens, which must be considered as the great staples of the place, consist of ticks, flannels, sheetings, drillings, de laines, barèges, prints, and cassimeres. As recently as 1838 it was a village with about 50 inhabitants; in 1880 the population was 32,630.

MANCHESTER PARTY or SCHOOL, the name given to the political party, whose exertions were particularly directed to the development and thorough carrying out of the principles of free-trade. They came forward as a compact party in the Anti-Corn Law League, and had their chief seat in Manchester. Since the abolition of the corn laws this party have extended their programme, and agitate in favour of non-intervention in foreign affairs, of arbitration instead of war, &c. Several eminent statesmen have been connected with it, among others Richard Cobden and John Bright.

MANCHINEEL (*Hippomane mancinella*), a West Indian tree, celebrated for the poisonous qualities of the milky juice which abounds in every part of it. When a drop of the juice is applied to the skin it causes the same sensation as a burning coal, and quickly produces a vesicle. The Indians use it for poisoning the points of their arrows, which preserve their venom for a long time. The workmen employed in felling these trees first build a fire round the trunks in order to make the juice evaporate, and cover their eyes with gauze; but, notwithstanding these precautions, they are subject to be incommoded with the dust. The accounts, however, which represent it as dangerous to sleep in the shade, or to come in contact with the rain which has fallen upon this tree, are highly exaggerated. The inhabitants of Martinique formerly burned entire forests of the manchineel, in order to free their dwellings from its presence. The tree belongs to the natural order Euphorbiaceæ; the leaves are alternate, ovate, serrate, and shining; the fruit has the form, colour, and scent of a small apple, and contains a nut about as large as a chestnut. It is said that drinking copiously of

sea-water is the best remedy when a portion of this fruit has been swallowed. The manchineel grows in the West Indies and other parts of tropical America, near the ocean.

MANCHOORIA, or MANCHURIA (Chinese, *Shing-King*), a territory belonging to the Chinese Empire. It occupies the east extremity of the great Asiatic plateau, and extends, since the cession of portions of the territory to Russia in 1857 and 1860, between lat. 40° and 53° N., and lon. 118° and 133° E., and is bounded on the north and east by the Amur or Amoor and Usuri, which separate it from the Russian territory; on the west by the provinces of Irkutsk, Mongolia, and Tchi-li; on the south by the Gulf of Leaotung, the Yellow Sea and Corea. The principal rivers are the Amur, the Songari, the vast basin of which occupies a great part of the territory; the Argun and Usuri, like the Songari, tributaries of the Amur; and the Leao-ho, watering the province of Leaotung, falling into the gulf of that name. Manchooria is divided into three provinces—Shing-king, Kirin, and Tsi-tsi-kar. Shing-king, which includes the ancient province named Leaotung, lies between Tchi-li and Mongolia on the west, the Gulf of Leaotung and the Yellow Sea on the south, Corea on the east, and a palisade of stakes, with twelve stations guarded by soldiers, which forms its north-west boundary. Its principal town, and the capital of Manchooria, is Moukden, about 200 leagues north-east of Pekin. The province of Kirin is now comprised within the Sagalien on the north, Tsi-tsi-kar, Mongolia, and Shing-king on the west, Corea to the south, and the river Usuri to the east. Kirin, on the Songari, is the chief town of the province. The province of Tsi-tai-kar, is now bounded north and north-east by the Amur and Russian possessions, west by Argun, south by Mongolia, and south-east by the province of Kirin. The principal town is Tsi-tsi-kar, situated on the Nouni. Vast chains of mountains ramify all over the country, one of them forming the south limits of the valley of the Amur. The aspect of this vast system of mountains and valleys is generally arid and desert. The cold of winter is intense, the thermometer sometimes falling to 30° below zero, and the snow lying for six months in the year. The southern districts of Shing-king and Kirin produce wheat, barley, millet, and some vegetables. Horses and cattle are also raised. The vast forests of the north are rich in useful timber of all kinds, and harbour the tiger, panther, bear, wolf, and stag, as well as the eagle and other birds of prey. The rivers abound with fish. The pearl-fishery on the coast is a government monopoly. The principal food crops are pulse, millet, barley, and wheat. The vine, indigo, cotton, opium, tobacco, &c., are cultivated, opium being far more valuable than any other product. The silk-worm is reared by the inhabitants. The government of Manchooria, confined exclusively to the Manchoos, has at its head a civil dignitary, resident at Moukden, who has three subordinate military commanders to administer the three provinces. The Manchoos are a Tungusian race. They are of a lighter complexion and a more powerful build than the Chinese, have the same conformation of the eyelids, but their countenances are far more expressive and intellectual. In the seventeenth century they invaded China, and placed their leader's son upon the throne. Since that time the Manchoo dynasty has continued to reign in China, and the Manchoo language has become the court and official language. By the gradual advance of the Russians into the territories north of the Amur, and their locating there a chain of settlements, they have obtained so firm a footing as to bring about the cession of territory already mentioned. Pop. 2,000,000.

MANCHUS, or MANCHOOS. See preceding article.

MANDALAY. See MANDELAY.

MANDAMUS. A writ of *mandamus* (we command) is, in general, a command issuing from some superior court, in the great majority of cases from the Court of Queen's Bench, directed to some inferior court, or to some person or corporation, requiring them to do some particular thing, which such superior court has previously determined it to be their duty to do, or at least supposes to be consonant to right and justice. It issues where a party has a right to have a thing done, and has no other remedy, and in some cases where he has another but a tedious and inadequate one; and must be applied for without delay. It is either in the alternative, ordering the court, corporation, or party to which or whom it is directed to do the thing specified, or to appear and show cause why it should not be done; or absolute, commanding the thing specified to be done without any condition or alternative. The writ is usually first issued in the alternative, directing the party complained of to appear and show cause against its being issued absolutely, and in case of there being no appearance, or no sufficient cause to the contrary being shown, an absolute mandamus is issued. The cases enumerated for the issuing of this writ are—to compel the party applying to be restored to some office or franchise of a public nature, whether temporal or spiritual; to an academical degree; to the use of a meeting-house, &c.: it lies for the production, inspection, or delivery of public books and papers; for the surrender of the regalia of a corporation; to oblige bodies corporate to affix their common seal; or to compel the holding of a court. It may be directed to an inferior court, ordering it to proceed in the hearing of a cause, or to enter up a judgment. It is sometimes directed to a corporation, directing them to choose officers. The statute of 2 Geo. II. cap. iv. provides for its being issued to command an election of a mayor or other chief magistrate of a city, town, or borough; and so, where one is elected to any office, as town-clerk, or is legally elected member of any public body, as one of the aldermen of a city, and is refused admission or recognition as such, this writ may be issued in his behalf. The proceedings on mandamus have been remodelled by the Common Law Procedure Acts, 1852 and 1854, so as to nearly resemble those on an ordinary action.

MANDARIN, the term usually applied by foreigners to government officials of every grade in China. It is supposed to be derived from the Portuguese *mandar*, to command, or from the Sanskrit *mantrin*, counsellor; the Chinese equivalent is *kwan*, which signifies literally a public character. Mandarins are either civil or military, and of each order there are nine classes, each class being again divided into two sub-classes. The position of a mandarin is obtained by open competition, but offices and titles are sold to a great extent. Although inferior in rank to the higher nobility, the mandarins form the effective ministry and magistracy of the country, and also fill the chief ranks in the army.

MANDARIN DUCK. See TEAL.

MANDAT, the name given to a certain kind of paper-money in the French revolution. After the *assignats*, which had been kept in circulation by the violence of Robespierre, had lost all credit, a new money was created—the *mandats*—founded, like the *assignats*, on the credit derived from the confiscated property, but with the essential difference that specific pieces of property, enumerated in a table, were pledged for the redemption of the bills, whilst the assignats furnished only a *general* claim. The mandats could be realized at any moment, as the owner was authorized to take any portion of the property

anodon and Hylæosaurus were discovered, the fresh-water origin of the wealden beds demonstrated, and many other important facts established in regard to the geology of that district. Dr. Mantell contributed numerous papers to the Transactions of the Royal and other societies, and is the author of The Fossils of the South Downs (1822), Illustrations of the Geology of Sussex (1822), and what have rendered him most famous as a popular writer, the admirable Wonders of Geology (1838) and Medals of Creation (1844). In 1835 he removed from Lewes to Brighton, and from thence in 1839 to Clapham, and a few years later to London. His magnificent collection of fossils was purchased in 1839 for the British Museum. He died in London on 10th November, 1852.

MANTELPIECE, properly the lintel or transverse beam above the opening of a fireplace, placed there to support the superincumbent masonry, but now very commonly applied to the jambs, lintel, and shelf which usually surround that opening.

MANTES, a town in France, in the department of Seine-et-Oise, on the left bank of the Seine, opposite to Limay, with which it communicates by two handsome bridges connecting the banks with an island in the river, 29 miles W.N.W. of Paris. It contains a fine Gothic church, with two lofty towers, which make a conspicuous appearance at a great distance; a beautiful Gothic tower, the only remains of the church of St. Maclou; and has manufactures of leather and saltpetre, famous breweries, numerous mills, and a trade in leather, corn, and wine. Pop. (1881), 5649.

MANTINEA (Greek, *Mantineia*), one of the most ancient and most important cities of Arcadia, on the frontier of Argolis, on the little river Ophis. Mantinea was known for its wealth, and famous for the battles fought near it. One of these was fought in B.C. 418, in the fourteenth year of the Peloponnesian war, in which the Argives, Athenians, and Mantineans were defeated by the Spartans, the consequence of which was that Argos seceded from Athens. In 385 B.C. the city was taken and destroyed by the Spartans, and the inhabitants dispersed over the surrounding villages; but after the battle of Leuctra, 371 B.C., they returned and rebuilt their city. In B.C. 362 another great battle was fought at Mantinea by the Thebans under Epaminondas against the Spartans, in which the latter were defeated, although the victory of the Thebans was purchased with the life of their commander. Mantinea afterwards joined the Achæan League, but as it subsequently deserted it and joined Sparta, it was, in 226 B.C., surprised by Aratus, and forced to receive an Achæan garrison. Having soon after expelled the Achæans and again joined the Spartans it was, in 222 B.C., taken by Antigonus Doson, and on this occasion was treated with great severity. The town was sacked, and the inhabitants sold as slaves. Another battle was fought near Mantinea B.C. 207, between Machanidas, tyrant of Lacedæmon, and Philopœmen, general of the Achæan League. The latter was victorious, and slew the tyrant with his own hand.

MANTIS, a genus of Orthopterous insects forming the typical examples of the tribe *Mantina*. These insects are readily recognizable from the large size and peculiar development of the front pair of legs, which appear as strong prehensile organs, by means of which they capture the other insects upon which they feed. The head is situated on the front of the first chest segment (*prothorax*); whilst this latter segment is itself of attenuated shape. The eyes are of large size, and the simple eyes number three. The raptorial legs consist each of a long *coxa* or hip-piece, and of a *thigh* of great length. The *tibiæ* or shins [illegible]ned backwards so as to rest upon the thigh-pieces, which latter, together with the shins, carry numerous strong spines. The wings are well developed, and exhibit the conformation characteristic of Orthopterous insects. The ordinary and folded appearance of the front limbs whilst resting on the hinder pairs gives to the insect the attitude of devotion or prayer, and hence the specific name of the familiar species—*Mantis religiosa*. Whilst in certain countries names such as *Prieu Dieu*, *Prega Diou*, &c., have been applied to these insects from similar reasons. The Mantina inhabit tropical regions, but are also found in France, Spain, and the warmer parts of Europe, in which districts they have been regarded by the peasantry as insects given to divination. Thus it is believed that they will point out the way to a traveller if asked, by moving one of the front legs; and the local name of 'soothsayers' has accordingly been given to them, whilst the signification of the word *mantis* in Greek bears a similar meaning. In the East and among the Turks the Mantina are regarded as sacred insects; whilst the Hottentots also look upon them with feelings of veneration. These insects engage in fierce combats among themselves; and the Chinese are said to keep them for the purpose of watching them fight. In habits the Mantina are fierce and voracious. They wait patiently for their insect-prey concealed amid the foliage of trees, and when the moment arrives, spring out suddenly to seize the unwary insect with the raptorial limbs. The leaf-insects (which see) and the walking-stick insects (*Phasmidæ*), were formerly classified with the Mantina, but modern entomologists have seen reason to separate out the latter insects to form separate and distinct genera. (Pl. LXV.–LXVI. fig. 10.)

MANTISSA. See LOGARITHMS.

MANTLE, the soft skin or integument of molluscous animals, technically known as the *pallium*. This structure secretes the shell when present, and where the shell is absent, the mantle forms an investing sac or integument in which the viscera or organs are contained and protected. The mantle lines the shell when that structure is developed; and through the agency of the lime-secreting glands of the mantle the shell is enlarged, or repaired in case of injury. In those Mollusca which possess shells the mantle may at certain points of its substance exhibit a thickening due to its being functionally more active at these points than at others. Such points are exemplified in the 'collar' or 'hood' of some molluscs (for example Gasteropods), upon which the formation and extension of the shell devolves. The form of the mantle varies greatly throughout the molluscan subkingdom. In the Lamellibranchiates (Oysters, Mussels, Cockles, &c.) the mantle is disposed in two equal folds, which inclose the viscera and line the shell. In the Gasteropoda, on the contrary, the mantle forms an oblique asymmetrical fold, which contains the greater proportion of the internal organs. In the shells of Lamellibranchiates the attachment of the mantle to the shell is indicated by a line recognizable in the dried shell, and to which the name of *pallial line* is given. (See MOLLUSCA.) And in some cases the mantle becomes intimately associated with the respiratory or breathing functions of Molluscs, in the absence of specialized breathing organs. (See also MOLLUSCA.)

MANTUA (Italian, *Mantova*), a town in Italy, Lombardy, capital of the province of the same name, 80 miles E.S.E. of Milan, on an almost insular site on the Mincio, which here divides into several arms, and afterwards spreads out into a marshy lake, partly natural and partly formed by art. The stagnant water and marshes surrounding the town make its site very insalubrious, but constitute one of its most important defences; and in connection with the

formidable works which inclose it on every side, and guard all its approaches, have made it the first fortress in Italy. The communication between the islands and with the mainland is maintained by means of several bridges—the longest of which, Ponte di San Giorgio, 800 yards in length, is regarded as a masterpiece. Mantua is entered by five gates. The streets are regular and wide; the houses which line them are always substantial, often rising in huge masses, with rows of long and lofty arcades, forked battlements, and feudal towers. The signs of departed greatness and continuing decay are very visible in Mantua. Near its centre the population seems dense, and there is much appearance of activity; but in many other parts numbers of houses are untenanted or in ruins; and in the outskirts grass grows freely in the streets. The most remarkable edifices are the cathedral, not very capacious, but after an elegant design by Giulio Romano; the church of Sant' Andrea, the finest church of Mantua, conspicuous from a distance by its majestic cupola and Gothic tower; the church of Santa Barbara, containing the mausoleum of Carlo Gonzaga; the church of San Sebastiano; the Castello di Corte, or ancient ducal palace of the Gonzagas, a huge irregular pile, flanked by machicolated towers, the whole in a half ruinous state, now partly used as barracks; the Palazzo Imperiale; the Torre della Gabbia, so called from an iron cage hanging from its centre, in which criminals were wont to be exposed; the Torre del Orologio, and the Torre dello Zuccaro; the Beccheria and Peschiera, or shambles and fish market, both built by Giulio Romano, and admirable in their kind; the house of Giulio Romano, the Palazzo Colloredo, with enormous caryatides supporting its façade; the Palazzo del Tè, outside the walls of the town, also built by Giulio Romano, and adorned with some of that master's largest frescoes; the Accademia Virgiliana di Scienze e Belle Arti; the Liceo, the military arsenal, two theatres, one called the Teatro Virgiliano, employed for open-air performances in summer, situated in a fine piazza also named after Virgil, and containing a marble pillar surmounted by a bronze bust of the poet; the library, containing 80,000 volumes and 1000 interesting MSS.; the civic and two foundling hospitals; the Monte di Pietà, the principal house of correction for the whole of Lombardy. The manufactures are of very limited extent. The trade is chiefly in the hands of the Jews, who live in a separate quarter called Il Ghetto. The principal article of trade is silk. There is also a considerable trade in timber, which is floated down the Mincio. Mantua is the see of a bishop, the seat of a civil, criminal, and mercantile court, and the residence both of a military governor and of a provincial delegate.

Mantua is a very ancient city, having been founded, it is said, by the Etruscans before the building of Rome. On the decline of the Roman Empire it was pillaged by the Huns, afterwards taken by the Longobards, and still later annexed to the Exarchate of Ravenna. Charlemagne is said to have given it its first fortifications. In 982 Tebaldo, of the family of Canossa, pretended to have received Mantua as a marquisate from the Emperor Otho II., but his son Bonifacio is the first who is mentioned as actually bearing that title. On his death in 1052 he was succeeded by his daughter Matilda, who afterwards inherited the Tuscan territory, with the title of countess from her mother Beatrice. Matilda died in 1115, leaving all her dominions to the holy see. Soon after Mantua succeeded in making itself independent, and continued so till 1276, when it fell under the iron rule of Buonacolsi or Bonacossi. In 1328 it found better masters in the Gonzagas, who, first as captains, then (from 1432) as marquises, and finally (from 1530) as dukes of Mantua, governed it with great ability, and distinguished themselves by the splendour of their court and their patronage of literature and art. In 1533 Federico II., the first duke of Mantua, came, through his wife, into the possession of the Marquisate of Montferrat, which was confirmed to him by the Emperor Charles V. in 1536. In 1627, by the death of Vincenzo, the last of the male descendants of Guglielmo, second son of Federico, the first duke, the Mantuan possessions reverted to the descendants of Luigi (Louis), duke of Nevers, and Rethel, third son of Federico. Carlo, the son of Luigi, had himself proclaimed Duke of Mantua and Montferrat, but his succession was opposed by the emperor. (See GONZAGA FAMILY.) In the war which ensued the Mantuan territory was laid waste by the imperial troops, and Mantua itself, already suffering from famine and pestilence, was sacked (1630). In the Peace of Cherasco, by which the war was concluded (1631), Carlo obtained the greater part of his hereditary dominions, but was compelled to give up a large part of Montferrat to Savoy. The last of the Gonzaga family who reigned in Mantua was the great-grandson of Carlo, called Ferdinando Carlo, or Carlo IV., who, having taken part with the French in the war of Succession, was declared to have incurred a forfeiture by withdrawing his allegiance from his liege lord the Emperor of Germany. The Mantuan territory was accordingly annexed to the Austrian possessions in Lombardy, and the remaining part of Montferrat was assigned to Savoy (1708). The fortifications of the town, previously formidable, were completed and put into their present form by the Austrians. Their strength was put to the test in 1796 by Napoleon, who, apparently hopeless of reducing it by any other means, contented himself with keeping it under strict blockade, till famine compelled the garrison to capitulate. After the cession of the western part of Lombardy to Sardinia in 1859, Mantua, with what else of Lombardy remained to Austria, was united to Venetia, and with it was given up to Italy in 1866. Among the distinguished natives of Mantua or its neighbourhood, by far the most illustrious name is that of the Roman poet Vergil or Virgil, who was born at the adjoining village of Andes, supposed to be the modern Pietole. Pop. (1881), 28,048.

MANU, in Hindu mythology, the head or ruler of a period of time called a Manwantara, which is the fourteenth part of a Kalpa or day of Brahma, each of which sees the creation and extinction of a world, and is followed by a night of Brahma of equal length with the day, during which all creation remains extinguished. Of the present Kalpa six Manwantaras have already elapsed, and we are now in the seventh, which is presided over by the Manu Vaivaswata. In the S'atapatha Brahmana one Manu is mentioned as the person through whom alone the human race was preserved from total destruction by a deluge. He is said to have been saved with the aid of a supernatural fish, who warned him of the coming danger, and instructed him how to escape from it. After his escape a woman was produced by the sacrifices of Manu, and from this pair has sprung the whole of the race of mankind. This legend does not speak of Manu as the creator of the human race, a title given him by later accounts, but merely as the person through whom the human race was continued. The name of Manu is also given as that of the author of a book of laws called Dharma-S'astra, still extant, and an ancient work on the Vedic rites. It is not known whether a real person is in this case designated by the name, or whether the two works mentioned are by the same person. In the case of the book of laws especially a mythical person, either

Swayambhuva, the Manu of the first Manwantara, or Vaivaswata, that of the present Manwantara, is supposed to be intended by the name, for at the beginning of the work the author speaks of himself as the creator of the human race. An edition of the original Sanskrit text of the Institutes of Manu, accompanied by an English translation by Sir W. Jones, was published at London in 1825. The translation had been published originally at Calcutta in 1794. The text, with notes by Auguste Loiseleur-Deslongchamps, was published at Paris in 1830, and a translation by the editor of this text in 1833. The name Manu is connected with the Sanskrit *man*, to think, and accordingly is literally 'the thinking being,' and also with the English *man*.

MANUMISSION, among the Romans, the solemn ceremony by which a slave was emancipated. (See FREEDMEN.) Constantine the Great, after his conversion, transferred to the Christian Church all such solemn ceremonies of the heathen. Thus he allowed the Christian masters to emancipate their slaves before the altar on festival days, and especially at Easter, by placing the deed of emancipation on the head of the freed man in the presence of the congregation.

MANURES, vegetable, animal, and mineral matters introduced into the soil to accelerate vegetation and increase the production of crops. Manures may act either mechanically on the soil, loosening it and making it more porous, for instance, or they may be introduced to supply elements wanting in the soil, but necessary as the food of plants, and which may have been exhausted by cropping. Calcareous manures, as marl, lime, chalk, shells, and gypsum, act in both ways. *Marl* is a natural compound earth, consisting of a mixture of clay and lime. Those varieties of it which contain more clay than lime are advantageous for a dry sandy soil; while calcareous marl, or that in which the lime predominates, is suited to an argillaceous soil. *Lime*, and especially that derived from fossil or living shells, is another excellent means of amending soils. It is particularly adapted to cold, marshy soils abounding in organic matters, as it opens the soil and assists powerfully in the conversion of animal and vegetable substances into nourishment for plants. Clover and turnips require a large quantity of it as food. *Ashes* are very beneficial to the soil by attracting moisture from the atmosphere, in consequence of the alkali they contain, and thus accelerating vegetation. *Gypsum* is another common mineral manure. It is strewed, in the state of fine powder, over crops, when the leaves are in full vigour. One of the constituents of plants that has most often to be supplied in manures is phosphoric acid, which exists in large proportion in grain, beans and peas, and potatoes. It is furnished by a number of *phosphatic manures*. Of these one of the most valuable is *bones*, either crushed or ground to the form of powder or meal. They are often dissolved in sulphuric acid (vitriol), by which means the phosphate of lime becomes soluble in water, and thus supplies plant food immediately to the soil. Mineral phosphates in the shape of certain stones and rocks, consisting chiefly of phosphate of lime, are now largely used, being commonly dissolved in sulphuric acid and then called mineral superphosphates. Superphosphate forms an excellent manure for turnips and other rapidly growing crops, and forms the main constituent in many artificial manures. One or two substances are used to add nitrogen to the soil where it is desirable. Sulphate of ammonia, obtained from gas liquor, is one of these. It acts as a stimulant, causing the plant to run up quickly into leaf, and it should therefore be used only when there is plenty of other plant food in the soil. The same may be said of nitrate of soda or Chili saltpetre, a white chalk found lying on the ground in Chili, Peru, &c. Both of these are generally used as top-dressings.

Common manure or *dung* consists of the remains of organized bodies of every description, whether animal or vegetable, in a state of decomposition (that is, resolving itself into those elements which can re-enter into the vegetable system). The soluble fertilizing substances in farmyard manure are ammonia, silica, phosphate of lime, magnesia, potash, sulphuric acid, carbonic acid, &c. Of these ammonia is the most important as supplying nitrogen, which cannot be obtained by the plants from the air or the soil in any quantity. Manure which has not completely undergone the process of fermentation, so that the straw is not yet wholly decomposed, is best adapted to strong compact soils; the tubular remnants of straw answer the purpose of so many little props to support the earth and afford a passage for the air, thus rendering the soil lighter; besides, the completion of the fermentation taking place after the manure is buried in the soil, has the advantage of raising the temperature. Those bodies which are subject to the most rapid decomposition are especially valuable for manure. Of this description are animal manures in general, which require no chemical preparation to fit them for the soil. The great object of the farmer is to blend them with the earthy constituents in a proper state of division, and to prevent their too rapid fermentation. In maritime districts *fish*, when sufficiently abundant, are sometimes used to manure the land. They afford a powerful manure, and cannot be ploughed in too fresh, though the quantity should be limited. Various waste matters are also useful manures, as *blood* from slaughter-houses, *skin* and *hoof* cuttings from tanneries and glue-works, waste from cloth mills, *woollen rags*, &c. During the putrefaction of *urine* the greatest part of the soluble animal matter that it contains is destroyed; it should, consequently, be used as fresh as possible; but if not mixed with solid matter it should be diluted with water, as, when pure, it contains too large a quantity of animal matter to form a proper fluid nourishment for absorption by the roots of plants. Amongst excrementitious solid substances, one of the most powerful is the *dung of birds* that feed on animal food, particularly the dung of sea-birds. *Guano*, which is used to a great extent almost everywhere, is a production of this kind. It consists principally of organic matters yielding ammonia, and of phosphates of lime and magnesia, and may therefore be considered a mixed ammoniacal and phosphatic manure, the ammonia being the most valuable constituent. Guanos containing a large quantity of nitrogen form a very powerful manure, acting rapidly on turnips, corn crops, and potatoes. Those abounding in phosphates and containing little nitrogen are usually dissolved in sulphuric acid. *Night-soil*, it is well known, is a very powerful manure, and very liable to decompose. Its disagreeable smell may be destroyed by mixing with quicklime, after which, if exposed to the atmosphere in thin layers in fine weather it speedily dries, is easy pulverized, and in this state may be used in the same manner as rape-cake, and delivered into the furrow with the seed. If the pure *dung of cattle* is to be used as manure, like the other species of dung which have been mentioned, there seems no reason why it should be made to ferment, except in the soil; or if suffered to ferment, it should be only in a very slight degree. A slight incipient fermentation is undoubtedly of use in the dunghills; for by means of it a disposition is brought on, in the woody fibre, to decay and dissolve when it is carried to the land or ploughed into the soil; and

woody fibre is always in great excess in the refuse of the farm. Too great a degree of fermentation is, however, very prejudicial; and it is better that there should be no fermentation at all before the manure is used, than that it should be carried too far. In cases where farm-yard dung cannot be immediately applied to crops the destructive fermentation of it should be prevented very carefully, by defending the surface of it as much as possible from the oxygen of the atmosphere; a compact marl or a tenacious clay offers the best protection against the air; but before the dung is covered over, or, as it were, sealed up, it should be dried as much as possible. If the dung is found to heat at any time, it should be turned over and cooled by exposure to air. When a thermometer plunged into it does not rise above 100° Fahr. there is little danger of much aeriform matter flying off; if the temperature is above that point, the dung will require to be immediately spread open. Also, when a piece of paper moistened in hydrochloric acid, held over the steams arising from a dunghill, gives dense white fumes, it is a certain test that the decomposition is going too far; for this indicates that ammonia is disengaged. The situation in which dung is kept by farmers is often very injudicious, it frequently being exposed to the direct influence of the sun; whereas it should always be kept under sheds, or at least on the north side of a wall. Vegetable manure does not undergo fermentation previous to being buried in the soil. Of this kind of manure *green crops*, such as clover, lupins, and buckwheat, which are ploughed into the soil, are the best, since they contain a considerable quantity of water, and when buried serve to lighten the soil previous to decomposition. It is especially adapted to hot climates. *Sea-weeds*, consisting of different species of Fuci, Algæ, and Confervæ, are much used as a manure on the sea-coasts. This manure is more transient in its effects, and does not last for more than a single crop, which is easily accounted for from the large quantity of water, or the elements of water, which it contains. It decays without producing heat when exposed to the atmosphere, and seems, as it were, to melt down and dissolve away. It should be used as fresh as it can be procured, and not suffered to lie in heaps exposed to the air for six months or a whole year, as it is often allowed to do. *Soot*, which is principally formed from the combustion of wood and pit-coal, contains likewise substances derived from animal matters, and is a very powerful manure. It requires no preparation, but is thrown into the ground with the seed.

Modern researches upon plant nutrition, and the chemistry of agriculture in general, have shown us that the food of plants may be classed under the two headings of *air food* and *mineral food*. Air food consists of ammonia, water, and carbon dioxide; mineral food, of those substances which remain as ash when the plant is ignited. The former class of food is supplied to the plant partly from the atmosphere and partly from the soil, the latter from the soil entirely. In the production of food by natural processes of plant-growth a certain amount of air food and also of mineral food is abstracted from the soil, those amounts varying for different species of plants; if this food be returned to the soil, then a further growth of plants may be expected; if, however, seed is sown in the partially impoverished soil, there must be a decrease in the amount of crop obtained from that soil. As the plants serve to nourish animals, it follows that the substances which have been withdrawn from the soil by the plants may be returned to it in the shape partly of animal excreta, and partly of ground bones, &c. As has been already stated, different plants require different kinds of food; if, therefore, the kind of crop grown on the same land be varied from year to year, and if the soil be tilled so as to unlock its natural supplies of mineral food, it will be found that the average yield of crops may be maintained simply by the restitution to the land of that amount of food which has been removed from it by the plants. In this restitution it must be borne in mind that it is not only mineral but also air food which is to be restored. Plants undoubtedly draw large supplies of nitrogen and carbon from the atmosphere, but it has been abundantly proved that unless this supply is augmented by artificial sources the plants soon begin to fall off and the yield of crop very sensibly to diminish. The great end, therefore, to be aimed at is to supply such materials as shall—taken along with those already existing in the soil and in the air—prove sufficient to maintain the plant-growth up to the average amount.

In countries such as England or Belgium, where the land is limited in extent, and where the population is large, it is necessary to obtain year by year the greatest possible yield of crop from the land. To do this it is absolutely necessary that more plant food be given to the soil than what is abstracted therefrom by the plants; and this plant food must consist chiefly of air food, more especially of nitrogenous substances. Land generally contains a comparatively large quantity of mineral food, which by a proper system of tillage may be made available for plants; but unless this be accompanied by a proper proportion of carbonaceous and nitrogenous substances and water the mineral food alone is totally unable to maintain plant life in profusion. It therefore becomes a most important matter to maintain the proper ratio between the amounts of those two kinds of plant food, and for this purpose artificial manures are found to be very serviceable. By a rotation of crops the fertility of soil is also maintained. It is found, as we have before noticed, that certain plants remove a large amount of the mineral constituents from the soil. If, after removing one or two crops of such plants, a crop of plants be taken which can assimilate to themselves large quantities of nitrogenous substances, and if the ground at the same time be properly tilled, it is evident that the mineral constituents will have time again to accumulate in the soil, while at the same time we shall have in the plants which assimilate nitrogen and carbon a storehouse of these last-named substances, from which they may be again returned to the soil as manure, after having served to nourish animal life in some form or other.

The theory of manuring consists, then, in maintaining in the soil such an amount of plant food, both mineral and organic, as shall enable us to reap the largest possible amount of crops from that soil.

MANUSCRIPTS (Latin, *manu scriptus*, written by the hand) are literally writings of any kind, whether on paper or any other material, in contradistinction to printed matter. Previous to the introduction of printing all literature was contained in manuscripts. All the existing ancient manuscripts are written on parchment or on paper. The paper is sometimes Egyptian (prepared from the real papyrus shrub), sometimes cotton or silk paper (*charta bombycina*), which was invented in the East about the year 706 A.D., and used till the introduction of linen paper, and in common with this till the middle of the fourteenth century; sometimes linen paper, the date of the invention of which, though ascribed to the first half of the thirteenth century, on the authority of a document of the year 1243, written on such paper, is nevertheless exceedingly doubtful. The earliest mention of pens is found in the seventh century. The most common ink is the black, which is very old. The oldest, however, was not mixed with

vitriol, like ours, but generally consisted of soot, lamp-black, burned ivory, pulverized charcoal, &c. Red ink of a dazzling beauty is also found in ancient times in manuscripts. With it were written the initial letters, the first lines, and the titles, which were thence called *rubrics*, and the writer *rubricator*. More rarely, but still quite frequently, blue ink is found in ancient manuscripts; yet more rarely green and yellow. Gold and silver were also used for writing either whole manuscripts (which, from their costliness, are great rarities), or for adorning the initial letters of books. With respect to external form, manuscripts are divided into rolls (*volumina*, the most ancient way, in which the troubadours in France wrote their poems at a much later period) and into stitched books or volumes (properly *codices*). Among the ancients the writers of manuscripts were mainly freedmen or slaves (*scribæ librarii*). Some of the professional copyists in Rome were women. When Origen undertook the revision of the Old Testament (231 A.D.) St. Ambrose sent to his assistance a number of deacons and virgins skilful in calligraphy. Subsequently the monks, among whom the Benedictines in particular, were bound to this employment by the rules of their order. In all the principal monasteries was a *scriptorium*, in which the *scriptor* or scribe could pursue his work in quiet, generally assisted by a *dictator*, who read aloud the text to be copied; the manuscript was then revised by a *corrector*, and afterwards handed to the *miniator*, who added the ornamental capitals and artistic designs. It is more difficult to form a correct judgment respecting the age of Greek manuscripts from the character of the writing than it is respecting that of Latin manuscripts. In general it is to be remarked that in a Greek manuscript the strokes are lighter, easier, and more flowing the older it is, and that they become stiffer in the progress of time. The absence or presence of the Greek accents is in no respect decisive. Moreover, few Greek manuscripts are found of an earlier date than the seventh, or at most the sixth century. The characters in Latin manuscripts have been classified partly according to their size (*majuscula*, *minuscula*), partly according to the various shapes and characters which they assumed among different nations or in various periods (*scriptura Romana antiqua*, *Merovingica*, *Longobardica*, *Carolingica*, &c., to which has been added since the twelfth century the *Gothic*, so called, which is an artificially pointed and angular character); and for all of those species of writing particular rules have been established, affording the means of estimating the age of a manuscript. Before the eighth century punctuation marks rarely occur: ever after the introduction of punctuation manuscripts may be met with destitute of points, but with the words separate. Manuscripts which have no capital or other divisions are always old. The *catch-word*, as it is termed, or the repetition of the first word of the following page at the end of the preceding, belongs to the twelfth or subsequent centuries. The fewer and easier the abbreviations of a manuscript are the older it is. Finally, in the oldest manuscripts the words commonly join each other without break or separation. The division of words first became general in the ninth century. The form of the Arabic ciphers, which are seldom found in manuscripts earlier than the first half of the thirteenth century, also assists in deciding the age of a manuscript. Some manuscripts have at the end a statement when, and commonly also by whom, they were written (*dated codices*). But this signature often denotes merely the time when the book was composed, or refers merely to a part of the manuscript, or is entirely spurious. The most ancient manuscripts still preserved are those written on papyrus which have been found in Egyptian tombs. Those in the museum of the Louvre are said by competent authorities to have been written more than thirty centuries ago. Next to them in point of age are the Latin manuscripts found at Herculaneum, of which there is a rich collection in the Naples Museum. Then there are the manuscripts of the imperial era, among which are the Vatican Terence and Septuagint, and the Alexandrine codex of the British Museum. In 1825 a fragment of the Iliad, written on papyrus, was discovered on the Island of Elephantine in Upper Egypt, which is unquestionably the oldest of all classical manuscripts, and probably of the times of the Ptolemies. It was the custom in the middle ages to obliterate and erase writings on parchment, for the purpose of writing on the materials anew. For some account of these *codices rescripti*, or *palimpsests*, see PALIMPSESTS. This custom ceased in the fourteenth century, probably because paper came then more into use.

The art of illuminating manuscripts dates from the remotest antiquity. The Egyptian papyri were ornamented with vignettes or miniatures attached to the chapters, either designed in black outlines or painted in primary colours in distemper. The Greek and Roman manuscripts of the first century with which we are acquainted were not illuminated. The oldest ornamented manuscripts that have survived are the Dioscorides of Vienna and the Virgil of the Vatican, both of the fourth century, and having vignettes or pictures in a Byzantine style of art. The use of ornamental initial letters was introduced at an early period, and must be distinguished from the painted pages of the Byzantine manuscripts. At first the initial letters were of the same size and colour as the text, but the Syriac manuscripts of the seventh century have them with a pattern or border. They soon increased to a great size, being in some cases 24 inches in length. They were most used in the eighth and ninth centuries. They at last degenerated to the last decadence of art, the grotesque. From the eighth to the eleventh century the initials in use were composed of figures of men, quadrupeds, fishes, birds, &c. The initials of the twelfth century are made up of masses of conventional foliage interspersed with the animal figures of the preceding centuries. Continuous borders, with vignettes, tail-pieces, &c., were also prevalent in later times, and some manuscripts are ornamented with very artistic designs. The English and French manuscripts may be recognized by their delicate light-blue and green colours; those of Flanders by the heaviness of their drawing and the dark hues of the colouring. In Italy and Spain the tortuous patterns of animals and flowers were painted in bright colours and gold. In the early Irish manuscripts the figures are rudely drawn; the writing is large and bold, and the capitals profuse. The peculiarity of this style is the use of dots, generally in red, following the outline of the initials; delicate spiral lines, interlaced ribbons, and tesselated patterns. The most interesting specimens of this style are the Book of Kells at Dublin, and the Durham Book in the British Museum. In the sixteenth century the art became extinct.

MANUTIUS, ALDUS, or ALDO MANUZIO, an Italian printer of the fifteenth and sixteenth centuries, celebrated as an artist and a man of letters. He was born at Bassano, in the Roman territory, about 1447, and was educated at Rome and at Ferrara. He became tutor to Alberto Pio, prince of Carpi, and in 1482 quitted Ferrara to reside with John Pico, prince of Mirandola. In 1488 he established himself as a printer at Venice, but the first work which he finished was not published till 1494.

In the course of the ensuing twenty years he printed the works of the most ancient Latin and Greek authors extant, as well as many productions of his contemporaries, and some treatises of his own composition. Among the latter are a Latin Grammar, a Greek Grammar, a tract on the Metres of Horace, and a Greek Dictionary. He was the inventor of the italic or cursive character, hence called *Aldine*, for the exclusive use of which, for a term of years, he obtained a patent from the pope and the senate of Venice. He established a kind of academy at his own house, and delivered lectures on classical literature, to the general study and improvement of which he greatly contributed. He died in April, 1515. His business was continued by his son Paolo Manuzio, born 1512; died 1574, a man distinguished as a classical scholar no less than as a printer; and by his grandson Aldo, born 1547; died 1597. With him expired the glory of the Aldine press. See ALDINE EDITIONS.

MANYPLIES, the popular name given to the *psalterium* or *omasus*, the third chamber or cavity of the ruminant stomach. The term manyplies, and also the technical name psalterium, were applied to this chamber from the arrangement of its lining membrane, which is disposed in longitudinal folds or lamellæ, resembling in some degree the leaves of a book. This chamber of the stomach communicates with the gullet superiorly, and also with the second stomach or *reticulum* ('*honeycomb*'); and it is into the manyplies that the food, after being remasticated in the mouth, is returned for the purpose of undergoing in this and in the last chamber (*abomasum* or '*rennet*') the ultimate process of digestion and solution.

MANZONI, ALESSANDRO, an Italian poet and novelist, was born in Milan, 8th March, 1784. He was the son of Count Pietro Manzoni and of the Marchioness Giulia Beccaria, daughter of the celebrated economist Cesare Beccaria. He studied at Milan and Pavia, and on the death of his father in 1805 accompanied his mother to Paris. Up till his twentieth year he was a freethinker and rather dissipated; but after that time he became a strict adherent of the Church of Rome, and led a life of exemplary purity. In 1806 he published his poem on the death of his friend Imbonati, which was followed in 1808 by his Sacred Hymns (Inni Sacri). In 1819 appeared his first tragedy, Il Conte di Carmagnola, the first drama in which an Italian defied the unities. This play was reviewed and praised by Goethe, who took a warm interest in every subsequent production of Manzoni. The death of Napoleon inspired one of the finest odes of the century, Il cinque Maggio (The fifth of May). In 1823 his second tragedy, Adelchi, appeared. This play, as well as its predecessor, finds more favour in the closet than on the stage. After this Manzoni divided his time between country pursuits at his residence in the neighbourhood of Milan and the composition of his immortal romance I Promessi Sposi (The Betrothed), a Milanese story of the seventeenth century, which was published in three vols. (Milan, 1827), and which has been translated into most of the European languages. From that time no work of general interest issued from his pen. He withdrew into private life, taking no part in the political agitations of the times, but devoting himself to the study of the Italian language. He strove earnestly to make the Florentine dialect the universal language in Italy. He outlived all his family, and died on the 22d May, 1873. As a poet he outrivalled all his contemporaries, and his novel is without question the finest work of its kind in the language.

MAORIS, the name given to themselves by the natives of New Zealand. See NEW ZEALAND.

MAP, a projection on a plane surface of the whole or a part of the spherical surface of the earth. The earth being a spheroid, its surface cannot be made to coincide rigorously with a plane; and it therefore becomes necessary to have recourse to a projection, that is, a plan on a plane surface, which indicates the relative positions, dimensions, &c., of the different parts of a spherical surface. The five principal modes of projection are the orthographic, the stereographic, the globular, the conical, and the cylindrical or Mercator's, distinguished by the different points of view at which the observer is supposed to be placed. In the orthographic projection, the point of view is supposed to be at an infinite distance from the sphere, so that all lines drawn to it may be regarded as parallel. If, then, from every point on the surface of the sphere lines be drawn perpendicular to the plane of a circle passing through its centre, their points of intersection with this plane will be an orthographic representation of the globe. From the nature of this projection it is evident that equal parts upon the surface of the sphere are not in all cases represented on the plane by parts either equal or similar; but that towards the circumference the countries are crowded together and diminished in size, while the central parts are exhibited in their true proportions. It is therefore of little use for geographical, though of considerable value for astronomical purposes. In the stereographic projection the eye is assumed to be placed on the surface of the sphere opposite the surface to be delineated. If the globe were transparent the eye would see the opposite concave surface. If straight lines were then drawn from the eye to each point of this hemisphere their intersection with the plane of projection would be its stereographic projection. This projection does not give equal representations of equal arcs of the great circles which are perpendicular to the plane of projection; yet it represents all parts of the sphere by figures similar to those on the surface of the sphere itself. The spaces in it diminish from the circumference towards the centre, that is, in the contrary direction to those in the orthographic projection. Owing to the unequal area of the divisions, and the difficulty of finding the true latitude and longitude of places, this projection is seldom used. To rectify the opposite effects of the two preceding the globular projection, a modification of both, is adopted. In this projection the point of view is supposed to be vertically over the centre of the plane of projection, and at a distance from the surface of the sphere equal to the sine of 45° of one of its great circles. If straight lines be then drawn from the point of view to the interior surface of the opposite hemisphere their intersection with the plane of projection will be a perspective representation of it. This mode is much used in maps of the world; but to simplify their construction the meridians and parallels are projected into circular instead of elliptical arcs, the deviation from the strict law of the projection being too slight to affect the practical utility of the map. In the conical projection the sphere is supposed to be circumscribed by a cone which touches the sphere on the circle intended to represent the middle parallel of the map. If the points on the sphere be now projected on the cone by lines drawn from the centre, it is obvious that in a zone extending but a short distance on each side of the middle parallel, the points on the cone would very nearly coincide in position with the corresponding points on the sphere. All the delineations having been thus made, the cone is then supposed to be unrolled or developed on a plane surface. Should the map be made to extend much above or below the middle parallel the distant parts will be very much distorted. Since all meridians on the globe are great circles

passing through the poles, the north and south points at any place correspond with the poles of the earth. The east and west points, however, are indicated by a line at right angles to the meridian, and do not, except at the equator, correspond with those of the earth. Now in all the projections yet described the direction either of the north and south, or of the east and west points, is represented by a curved line, so that on such a map the course of a vessel would almost always be laid down in a curve, which could only be described by continually laying off, from the meridian under which she passed, a line at an angle equal to that made with the meridian by the point of the compass on which she was sailing. If a vessel were to steer in a direct north-east course by any of the previous projections she would, did nothing intervene, describe a spiral round, and eventually reach, the north pole: the seaman, therefore, requires a map which would enable him to steer his course by compass in straight lines only. This want is supplied by Mercator's chart, in which all the meridians are straight lines perpendicular to the equator, and all parallels straight lines parallel to the equator. The theory of Mercator's projection consists in regarding the globe as circumscribed by a cylinder, which touches the sphere at the equator. Suppose the hollow interior of the sphere to be inflated, and its surface made to expand uniformly in every direction until it touched the interior of the cylinder, the parallels of latitude would become circles inscribed within the cylinder, and the meridians would be lengthened out into straight lines parallel to each other, and in the direction of its length. If the cylinder were then cut open along one of the meridians and spread out into a flat surface, the inside of it would represent the parallels and meridians for a map of the world on Mercator's projection. It is constructed as follows: A line of any length is drawn to represent the equator. This line is divided into thirty-six or eighteen equal parts for meridians at 10° or 20° apart, and the meridians are then drawn through these perpendicular to the equator. From a table of meridional parts (a table of the number of minutes of a degree of longitude at the equator comprised between that and every parallel of latitude up to 80°) take the distances of the parallels and of the tropics and arctic circles from the equator, and mark them off above and below it. Join these points, and the projection is complete.

In the choice of details to be introduced into a map the author must be guided by the purpose of his delineations, and needs to be directed by experience, learning, and judgment. One map is designed to show the limits of states, the positions of towns and cities, the subdivisions of the country into provinces, departments, counties, &c.; another may be devoted more particularly to delineating the natural features of the region, its mountains, rivers, &c.; and details are selected accordingly. A military map should indicate every pass, ford, obstruction, &c., which may affect a march, facilitate or obstruct a manœuvre. A nautical map or chart should indicate every reef, sand-bank, or rock, delineating, as far as possible, not only the irregularities of the bottom, but the direction, &c., of the shores. To the seamen the nature of the bottom of the sea is interesting only within soundings; but to the physical geographer it is also important, as illustrative of the whole system of mountains and geological formations on the globe. There are also historical, botanical, mineralogical, &c., maps, designed to illustrate some particular point. In collecting and combining details astronomical observations and geodesical measurements must be employed when possible, at least for the prominent points, and where the author is deserted by these, the accounts of intelligent travellers, of former geographers, &c., must supply the deficiencies.

Maps are engraved on steel, copper, and other metals; also sometimes in wood, and are now lithographed with much effectiveness and great cheapness. Soon after the invention of the art of printing an attempt was made to print maps like manuscript notes by Sweynheim; later by Buckinck in 1478; in 1777 by Breitkopf, in Leipzig. Haas, at Basel, produced pretty good specimens (see his Carte des Partages de Pologne en 1772, 1793, et 1795); and the same thing has since been attempted; but the main object of cheap maps thus made, chiefly for children — an impressive and clear survey—seems not entirely attained.

We find traces of maps with the Egyptians in the times of Sesostris, who caused his hereditary dominions and his conquests to be represented on tablets for his people. We find mention of maps in Greece in the times of Aristagoras of Miletus (B.C. 500); and Socrates is said to have reproved the pride of Alcibiades by asking him to search for his own estates on a map. The Romans at their triumphs had pictures of the conquered countries carried before them, and had drawings of their territories in their archives, as Varro says. Cæsar himself took part in the surveying of different countries. Ptolemy (flourished 126–61 A.D.) drew maps according to the stereographic projection. Agathodæmon, an artist of Alexandria, drew twenty-six maps for the geography of Ptolemy, and with him the first period of the history of maps is generally closed. They were drawn from the accounts of travellers without well settled principles. There is a map extant, perhaps of the times of Diocletian (died 313), certainly not later than Theodosius (died 395), a military map, for the use of the Roman army, called the Peutinger Tables, from having belonged to a learned scholar of this name. The second period, which extends to the beginning of the sixteenth century, the time of the famous Behaim, can show metal globes, plane spheres, and maps. Nicolaus Donis corrected the maps of Ptolemy, had them cut in wood, and added five new ones. Sebastian Munster followed in his steps. In the third period maps became more and more perfect. Particular credit is due to those of Abraham Ortelius, Gerhard Mercator (born 1512; died 1594), William and John Blau (who produced 616 maps), Sanson, Schenk, Visschen, De Witt, Hondius. After them John Baptist Homann became famous, who consulted the most distinguished astronomers and mathematicians, and prepared 200 new maps. The most eminent geographers of the sixteenth and seventeenth centuries were men of learning, who, in the spirit of that age, adopted with zeal and obstinacy all the mistakes committed by the writers of antiquity, which thereby acquired an authority that was very difficult to be overthrown. The first requisite in a correct system of geography is to determine accurately the relative position of places; but in this the ancients were guilty of gross errors. The method which they employed to determine the latitude of places admitted of but little precision, and their determination of longitudes was still more erroneous. The countries with which the Greek and Roman writers were best acquainted were those on the Mediterranean, yet Constantinople is placed by Ptolemy two degrees north of its true position. The Arab writers increased this error to four degrees. The breadth of the Mediterranean was also increased far beyond the truth. Carthage is made 4° 32′ south of its true place. The errors in longitude were far greater, the length of the Mediterranean being made 62° instead of 41½°; in other words, it was made 1400 English miles longer

ARCTIC
OCEAN
Hall
Newman B
Land
Hayes
Pen.
Hayes Str.
Pr. Patrick I.
Parry Isles
Melville
N. Devon
Baffin Bay
GREENLAND
Banks Land
Prince Patrick I.
Wrangell I.
Victoria
Baffin Land
Cape Prince of Wales
Alaska
NORTH
AMERICA
Behring Sea
Hudson Bay
Labrador Peninsula
Aleutian Is.
Kodiak I.
Queen Charlotte Is.
British Columbia
Vancouver I.
Winnipeg
Superior L.
Michigan L.
Chicago
Detroit
Montreal
Quebec
Newfoundland
St. John
Halifax
Boston
New York
Philadelphia
Washington
San Francisco
Monterey
Mississippi R.
St. Louis
Texas
Florida
Bahama Is.
Gulf of Mexico
Mexico
Acapulco
Yucatan
Havana
WEST
INDIES
Caribbean Sea
(CENTRAL
AMERICA)
Sandwich Is.
Hawaii
Revillagigedo Is.
Equator
Galapagos Is.
Fanning I.
Christmas I.
Phoenix Is.
Marquesas Is.
Penrhyn Is.
Samoa Is.
Society Is.
Low Archipelago
Friendly Is.
Cook Is.
Tahiti
Tongatabu
Rimatara I.
Pitcairn
Easter I.
Ross I.
Bermudas
Cape Verd Is.
Azores
Lisbon
Madeira
Canary Is.
Tropic of Cancer
Sierra Leone
Liberia
Guinea
Ivory Coast
Gold Coast
Dahomey
Benin
Cameroon
Fernando Po
Gaboon
Congo
Angola
Benguela
Mozambique
Madagascar
Mauritius
Cape of Good Hope
Natal
Port Natal
Delagoa Bay
Zanzibar
Abyssinia
Red Sea
Arabia
Aden
Persian Gulf
Muscat
Bombay
Calcutta
Madras
Ceylon
Colombo
Pondicherry
Goa
Malabar
Coromandel
Ganges R.
Burmah
Rangoon
Siam
Bangkok
Singapore
Malacca
Sumatra
Java
Batavia
Borneo
Celebes
Philippine Is.
Manilla
Luzon
Mindanao
Moluccas
Timor
Australia
Sydney
Melbourne
Adelaide
Perth
Swan River
Port Essington
Torres Str.
Gulf of Carpentaria
Cape York
Great Barrier Reef
Coral Sea
Norfolk I.
New Caledonia
Fiji Is.
Kermadec Is.
NEW
ZEALAND
Auckland
Wellington
Chatham Is.
Cook's Str.
Cape Horn
Tierra del Fuego
Strait of Magellan
Falkland Is.
Patagonia
Buenos Ayres
Rio de la Plata
Montevideo
Rio Janeiro
Bahia
Pernambuco
Para
Amazon R.
Orinoco R.
Caracas
Trinidad
Tobago
Barbadoes
Jamaica
Hayti
Cuba
Florida Str.
Key West
Charleston
Savannah
Cape Hatteras
Cape Cod
Cape Race
Cape Breton I.
Nova Scotia
Labrador
Hudson Str.
Baffin's Bay
Davis Str.
Greenland
Iceland
Reykjavik
Faroe Is.
Shetland Is.
Orkney Is.
Scotland
Ireland
Dublin
Liverpool
London
Paris
Brest
Bordeaux
Lisbon
Gibraltar
Malta
Sicily
Naples
Rome
Venice
Vienna
Berlin
Hamburg
Copenhagen
Stockholm
Christiania
St. Petersburg
Moscow
Archangel
Nova Zembla
Spitzbergen
Greenland
Behring Str.
Kamtschatka
Japan
Yeddo
Nagasaki
Formosa
Hong Kong
Canton
Macao
Pekin
Great Wall of China
Tartary
Siberia
Lena R.
Obi R.
Irtish R.
Caspian Sea
Black Sea
Constantinople
Smyrna
Egypt
Alexandria
Cairo
Nile R.
Suez
Mecca
Jerusalem
Persia
Teheran
Ispahan
Bagdad
Euphrates R.
Tigris R.
Mediterranean Sea
Gibraltar
Strait of Gibraltar
Tropic of Capricorn
Equator
Arctic Circle
Antarctic Circle
ANTARCTIC
OCEAN
Graham
Land
Alexander I.
Land
Sandwich Land
South Orkney Is.
South Shetland Is.
Falkland Is.
Tierra del Fuego
Cape Horn
Strait of Magellan
Patagonia
Buenos Ayres
Rio de la Plata
Montevideo
Rio Janeiro
Bahia
Pernambuco
Para
Amazon R.
Orinoco R.
Caracas
Trinidad
Tobago
Barbadoes
Jamaica
Hayti
Cuba
Florida Str.
Key West
Charleston
Savannah
Cape Hatteras
Cape Cod
Cape Race
Cape Breton I.
Nova Scotia
Labrador
Hudson Str.
Baffin's Bay
Davis Str.
Greenland
Iceland
Reykjavik
Faroe Is.
Shetland Is.
Orkney Is.
Scotland
Ireland
Dublin
Liverpool
London
Paris
Brest
Bordeaux
Lisbon
Gibraltar
Malta
Sicily
Naples
Rome
Venice
Vienna
Berlin
Hamburg
Copenhagen
Stockholm
Christiania
St. Petersburg
Moscow
Archangel
Nova Zembla
Spitzbergen
Greenland
Behring Str.
Kamtschatka
Japan
Yeddo
Nagasaki
Formosa
Hong Kong
Canton
Macao
Pekin
Great Wall of China
Tartary
Siberia
Lena R.
Obi R.
Irtish R.
Caspian Sea
Black Sea
Constantinople
Smyrna
Egypt
Alexandria
Cairo
Nile R.
Suez
Mecca
Jerusalem
Persia
Teheran
Ispahan
Bagdad
Euphrates R.
Tigris R.
Mediterranean Sea
Gibraltar
Strait of Gibraltar
Tropic of Capricorn
Equator
Arctic Circle
Antarctic Circle
ANTARCTIC
OCEAN
Graham
Land
Alexander I.
Land
Sandwich Land
South Orkney Is.
South Shetland Is.
THE
ON MERCAT

ARCTIC OCEAN
Kara Sea
Lapland
RUSSIA
SIBERIA
EMPIRE
ASIA
Mongolian
CHINA
TIBET
PERSIA
INDIA
Arabian Sea
Bay of Bengal
Philippine Islands
EAST INDIAN ARCHIPELAGO
Java
Sea of Okhotsk
Behring Sea
Coral Sea
AUSTRALIA
Western Australia
New South Wales
Tasmania
North Island
South Island
NEW ZEALAND
INDIAN OCEAN
Wilkes Land
Victoria Land
PROJECTION

than the reality. This enormous error continued in the maps of Europe, with little variation, till the beginning of the last century. The difference in the estimated longitude of Rome and Nürnberg, two of the best known places in Europe, varied above 500 miles from the fifteenth to the seventeenth century. The error is still more remarkable as existing in the longitude of places which are nearly in the same latitude. Cadiz and Ferrara, for instance, were placed nearly 600 miles too far asunder; and this error continued till the close of the seventeenth century. Errors of a wilder kind, originating in credulity rather than in inaccurate observation, found a place in the maps of the middle ages, and were slowly banished at a recent date by the improvements of astronomy and navigation. In a map of the world published at Venice in 1546, Asia and America are united in latitude 38°. Thibet is placed at the junction of the two continents. In another Venetian map, by Tramezini, dated 1554, the distance from Quinsai in China, to the Gulf of California in America, is only 31°, the two continents being unduly stretched some thousand miles respectively to the east and the west. The best maps were long deficient in correct distances, particularly in longitude. South America is represented by Fischer as 62°, or above 4300 miles across, while North America, on the same map, extends, from the mouth of the St. Lawrence on the east to New Albion on the west, through a space of 150°, or above 9000 miles. Hondius, in 1630, ventured indeed to abridge Asia of the undue dimensions given it by Ptolemy, and to reduce its extension towards the east to 165°. But his example was not followed; and many instances might be adduced in which the authority of Ptolemy, who was but slightly acquainted with one half of the globe, was blindly submitted to in an age when Europeans wandered over its whole surface. A great step was made towards the attainment of accuracy in regard to longitudes when Galileo discovered, in 1610, the eclipses of Jupiter's satellites. Until, however, Cassini published his tables in 1668 nothing accurate was known respecting their eclipses and revolutions. Cassini laboured indefatigably to improve geography by allying it strictly with astronomy, and loudly complained that it needed a total reform. Delisle, his friend, set seriously about the task of reconstructing the geographical edifice. In the year 1700 he published his map of the world, as well as separate maps of Europe, Asia, and Africa, boldly departing from the examples of his predecessors, and making free use of the materials which the improvements in astronomy had placed within his reach; so that he may be considered the creator of modern geography. His distinguished disciple, D'Anville, appointed geographer of the King of France at the age of twenty-two, was remarkable for correctness of judgment and fineness of penetration. Though he proceeded much on conjecture he rarely erred. He completed what Delisle had begun. For further information on the subject of geography and geographical works see GEOGRAPHY and GAZETTEER; see also DEGREES (MEASUREMENT OF).

MAP, or MAPES, WALTER, a famous scholar and poet of the twelfth century, a native of the Welsh Marches, supposed to have been born about 1150, and to have died about 1210. He studied at the University of Paris, and became a favourite at the court of Henry II. He was charged with a political mission to the court of Louis VII. of France, attended the Lateran Council of 1179, and was appointed Archdeacon of Oxford in 1199. By some recent critics he is believed to have contributed to the Arthurian cycle of romance the romances of the Quête du Saint Graal, Lancelot du Lac, and the Mort Artus. He is the author of a curious book, De Nugis Curialium, a note-book of the events of the day and of court gossip. It was edited for the Camden Society in 1850 by Thomas Wright. To Map are also attributed several Latin poems which have been also published by the same society. Among the most remarkable are the satirical Apocalypse and the Confession of Bishop Golias, of which the famous drinking-song beginning

Meum est propositum in Taberna mori,

forms a part. The poems include a rhymed description of Wales.

MAPLE (*Acer*), a genus of plants peculiar to the northern and temperate parts of the globe, consisting of trees or arborescent shrubs, having opposite and more or less lobed leaves, and small flowers, which are either axillary or disposed in racemes. The fruit consists of two capsules united at base, each containing a single seed, and terminated by a wing-like membrane, called *key* in English and *samara* by botanists. In one instance the leaves are compound and pinnated. Twenty-seven species are known, of which six are found in Europe, twelve are found in North America, six in the islands of Japan, and the remainder in different parts of Asia.

The red maple (*A. rubrum*) is one of the most common and most extensively diffused of American trees. It grows in moist situations, from lat. 49° to the Gulf of Mexico, both in the Atlantic and Western States. The bright red blossoms, appearing at a time when there is no vestige of a leaf in the forest, render this tree very conspicuous at the opening of spring; and again, at the close of the season, it is not less conspicuous from the scarlet colour which the leaves assume when they have been touched by the frost. The leaves are cordate at base, unequally toothed, five-lobed, and glaucous beneath. It attains the height of 70 feet, with a diameter of 3 or 4 feet at the base. The variety called *curled maple*, from the accidental undulation of the fibres, is one of the most ornamental woods known, and bedsteads made of it exceed in richness and lustre the finest mahogany. It is sometimes employed for inlaying, but its most constant use is for the stocks of rifles and fowling-pieces. The white maple is chiefly remarkable for the beauty of its foliage, the leaves being larger and much more deeply lobed than those of the preceding, and glaucous beneath.

The sugar maple (*A. saccharinum*) is a valuable tree. Besides the sugar which is obtained from the sap the wood affords excellent fuel; and from the ashes is procured potash. The sugar is superior in quality to the common brown sugar of the West Indies, and when refined equals the finest in beauty. The sap of all the maples contains a certain quantity of sugar, but in none that we know of does it exist in so great a proportion as in this and the following species. A single tree of this species will yield 5 or 6 lbs. of sugar. The leaves are smooth, and five-lobed, with the lobes sinuately dentate. It grows in cold and moist situations between the 42d and 48th parallels of latitude, and on the Alleghanies to their south-western termination, extending westward beyond Lake Superior, and is abundant in the northern parts of Pennsylvania, the western portion of New York, Upper Canada, New Brunswick, Nova Scotia, and in the northern parts of New England. The potash is exported from the two principal northern ports, New York and Boston. To the latter place the wood is brought in great quantities from Maine for fuel. A variety with undulations like the curled maple, and containing besides small spots, is called *bird's-eye maple*, and forms beautiful articles of furniture. The black sugar maple (*A. nigrum*) is a more

southern tree than the preceding, and is abundant on the Ohio and the other great rivers of the West. The sap yields abundance of sugar, which is manufactured in America.

The striped maple, or moose-wood (*A. striatum*) is a large shrub, chiefly remarkable from the white lines on the bark, which give it an elegant appearance.

The sycamore, or great maple (*Acer Pseudo-Platanus*), frequently called the plane-tree, is a native of Europe, with cordate leaves, smooth, with five acuminated, unequally-toothed lobes, and pendulous racemes. It is a large and handsome tree, of quick growth, especially when it is in a deep, free, rich soil, and in a mild climate. It arrives at its full growth in fifty or sixty years; but it requires to be 80 or 100 years old before its wood reaches perfection. At the age of twenty years it produces fertile seeds, but flowers several years earlier. The longevity of the tree is from 140 to 200 years, though it has been found of considerably greater age. It is everywhere common in this country. Dr. Walker supposes it to have been one of the very earliest foreign trees introduced into Scotland, where it has been much planted about old aristocratic residences. The wood is compact and firm without being very hard; it is of a fine grain, susceptible of a high polish, and easily worked either at the bench or in the turning-lathe. It is, however, applied to many more purposes in France and Germany than in Britain.

The long or large leaved maple (*A. macrophyllum*) is a tree of the largest size, a native of the north-west coast of North America, and introduced into England in 1812. It was first discovered by Menzies; and Douglas sent seeds and specimens home at a subsequent period, predicting that it would yet constitute one of our most ornamental forest-trees. The leaves are digitately five-lobed, with roundish recesses, but they vary much in size and in the way in which they are lobed.

The common maple (*Acer campestre*), has leaves heart-shaped, which have three or five deep segments, not serrated, and narrow at their base; branches covered when old with a corky bark; flowers in erect, branched, downy corymbs; keys short, smooth, with nearly parallel edges, diverging at right angles. This species is of very frequent occurrence, and in England is found in every hedgerow. It is either a bush or a tree, of inelegant appearance, and its wood is of little value.

Amongst other species may be mentioned the oval-leaved maple (*A. oblongum*), a native of India; it has been found incapable of bearing the climate of Britain. The polished maple (*A. laevigatum*), found in the woods in the higher regions of Nepaul and the Alps of Sirmoor. The Tartarian maple (*A. Tataricum*), a native of Russia in Asia. The guelder-rose-leaved maple (*A. Opulus*), found in France, especially in Dauphiny. The Neapolitan maple (*A. obtusatum*), a native of Hungary, Croatia, and many parts of Italy.

MARABOOTS, among the Berbers of Northern Africa a sort of saints or sorcerers, who are held in high estimation, and who exercise in some villages a despotic authority. They distribute amulets, affect to work miracles, and are thought to exercise the gift of prophecy. The rich presents which they receive from a superstitious people enable them to live with a good deal of pomp, often keeping an armed force, and maintaining a numerous train of wives and concubines. They make indeed no pretensions to abstinence or self-denial. The name Maraboots is also applied to a certain Arabic tribe, the Moravdes (Arabic, Borderers), which founded a dynasty in the north-western parts of Africa in 1075, and held Morocco and Spain for a considerable period.

MARACAYBO, a fortified town and seaport of Venezuela, South America, capital of the state of Falcon-Zulia. It is situated on the western side of the strait which unites the lake and gulf of the same name about 20 miles from the sea. Most of the houses are covered with reeds; it contains a large and handsome parish church, several convents and monasteries, and a college. There is some trade in coffee, cacao, leather, and medicinal plants. Large vessels cannot come up to the town on account of the bar at the mouth of the harbour, on which there are but 10 feet of water at high tide and 7½ feet at ebb. Pop. (1881), 22,224.

MARACAYBO, a lake of South America, about 98 miles long and 80 broad at the widest part, and about 250 miles in circumference. Its waters are fresh and sweet from the number of large rivers that fall into it, but when strong north winds prevail it becomes brackish towards the north end. It is of considerable depth except toward the shores. It communicates with the gulf of the same name by a strait about 18 miles long and 3 broad, opposite the town of Maracaybo, where it is defended by three forts situated on the island, among the shoals forming the bar. The gulf is in the Caribbean Sea, is about 60 miles wide at the entrance and 90 miles in length southward to the channel which unites it with the lake.

MARANHAM, or MARANHÃO, a province of Brazil, between 1° 20′ and 10° 50′ S. latitude, and 45° 10′ and 53° 20′ W. longitude; area, 177,515 square miles. It takes its name from an island situated at the mouth of three rivers, about 42 miles in circumference, which is fertile and well inhabited. The island itself is very difficult of access by reason of the rapidity of the three rivers which form it, so that vessels must wait for proper winds and seasons to visit it. The climate is extremely hot, and thunderstorms are of frequent occurrence in November and December, and continue to occur occasionally until March and even later. A considerable part of the surface is occupied by forests, which yield excellent timber and dye-woods. The soil of the province is very fertile, producing maize, cotton, sugar, rice, cocoa, pimento, ginger, &c. Pop. 359,040, exclusive of the savages. The number of negroes is very great. The capital is Maranhão.

MARANHAM, MARANHÃO, or SÃO LUIZ, the capital of the above province, situated on the west side of an island of the same name at the mouth of an estuary. On the east side it is surrounded by mountains, which form a kind of natural fortress, the town in that direction being accessible only by narrow passes. It is built on unequal ground, but with considerable regularity, and as almost all the houses have gardens attached it occupies a large extent of ground. The principal edifices are the cathedral and Episcopal palace, both magnificent structures, the governor's palace, the town-house and prison, the custom-house, treasury, college, the richly-endowed hospital *da Misericordia*, and various churches, monasteries, and nunneries. The trade is of great importance, Maranhão being the entrepôt for the produce of the provinces of Pará, Piauhi, Ceará, Rio-Grande-do-Norte, and Goyaz. The chief exports are rice, cotton, and rum. Pop. 31,604.

MARAÑON. See AMAZON.

MARASCHINO, or MARASQUINO, a fine liqueur distilled from bruised cherries, and sweetened with white honey or the finest sugar. The best known kinds are the maraschino de Zara, from Zara in Dalmatia, and that from Corsica. An inferior kind is made in Germany.

MARAT, JEAN PAUL, whose name is odiously notorious in the most hateful times of the French

revolution, was born at Boudry, in Neufchatel, in 1744, and studied medicine at Paris. Previous to 1789 he had spent many years in travel, visiting London, Edinburgh, Oxford, Dublin, Amsterdam, the Hague, &c., supporting himself by giving lessons in the modern languages, and at intervals publishing works on medical and scientific subjects, which display considerable acuteness and learning. Of a diminutive stature, with the most hideous features, in which some traits of insanity were perceptible, his whole appearance was calculated to excite at once terror, pity, ridicule, and disgust. The first breath of the revolution converted the industrious doctor into an audacious demagogue, if not into a ferocious maniac. He began by haranguing the populace of one of the sections, but was treated with ridicule, and hustled by the crowd, who amused themselves with treading on his toes. Still he persisted, and finally succeeded, by his violence and energy, in commanding attention. Danton had just instituted the club of the Cordeliers, and collected around him all the fiercest spirits, and Marat among the number, who became the editor of the Publiciste Parisien, better known under its later title L'Ami du Peuple, which was again changed to the Journal de la République Française, a journal which was the organ of that society, and soon became the oracle of the mob. As early as August, 1789, he declared it necessary to hang up 800 of the deputies, with Mirabeau at their head, in the garden of the Tuileries, and though he was denounced to the constitutional assembly, and proceeded against by the municipal authority of Paris, he contrived to escape, with the assistance of Danton, Legendre, and others, and by concealing himself in the most obscure corner of the city. His journal, meanwhile, continued to appear regularly, was openly hawked about the streets, and assumed a more furious and atrocious tone, as he was inflamed by the prosecutions of the authorities, and encouraged by the increasing strength of his party. During the existence of the legislative assembly he continued his outrages, figured among the actors of the 10th of August, and in the assassinations of September (1792). He was a member of the terrible committee of public safety, then formed, although without any official capacity, and signed the circular to the departments, recommending a similar massacre in each. Marat was chosen a member of the convention; and in spite of the contempt and abhorrence with which he was received in that body, particularly by the Girondists, who endeavoured at first to prevent his taking his seat, and afterwards to effect his expulsion, soon found encouragement to proceed with his sanguinary denunciations. The ministers, General Dumouriez and the Girondists, were the objects of his attack. Being charged in the convention with demanding in his journal 270,000 heads, he openly avowed and boasted of that demand, and declared that he should call for many more if those were not yielded to him. It is but fair, however, to state that the age was one of violence, and that the journals of the royalists were not one whit behind the Ami du Peuple in bloodthirstiness, and often outdid it in coarseness. The establishment of the revolutionary tribunal, and of the committee for arresting the suspected, was adopted on his motions. On the approach of May 31, as president of the Jacobin Club, he signed an address instigating the people to an insurrection, and to massacre all traitors. Even the Mountain party denounced this measure, and Marat was delivered over to the revolutionary tribunal, which acquitted him; the people received him in triumph, covered him with civic wreaths, and conducted him to the hall of the convention. July 13, 1793, his bloody career was closed by assassination. (See CORDAY, CHARLOTTE.) Proclaimed the martyr of liberty, he received the honours of an apotheosis, and his remains were placed in the Pantheon. It was not till some time after the dispersion of the Jacobins that the busts of this monstrous divinity were broken, and his ashes removed, and then it was as a royalist that he suffered this disgrace.

MARATHON, an ancient village of Greece, in Attica, about 20 miles north-east of Athens. It was situated on a plain which extends for about 6 miles along the sea shore, with a breadth of from 1½ to 3 miles. The site of the ancient village was not probably that of the present Marathona, but at a place now called Vrana, a little farther south. Through the centre of the plain runs a small brook. Here was fought the great battle between the Athenians and Persians, 490 B.C. See MILTIADES.

MARATTAS. See MAHRATTAS.

MARATTI, CARLO, painter and engraver, was born at Camerino, in the Marquisate of Ancona, in 1625, and while a child amused himself with painting all sorts of figures drawn by himself on the walls of his father's house. In his eleventh year he went to Rome, studied the works of Raphael, of the Caracci, and of Guido Reni, in the school of Sacchi, and formed himself on their manner. His Madonnas were particularly admired. Louis XIV. employed him to paint his celebrated picture of Daphne. Clement IX., whose portrait he painted, appointed him overseer of the Vatican gallery. He died at Rome in 1713. We are much indebted to him for the preservation of the works of Raphael in the Vatican, and of the Caracci in the Farnese Palace. He also erected monuments to those masters in the church della Rotonda. As an artist Maratti deserves the title given him by Richardson, of the last painter of the Roman school. His design was correct, and although he was not a creative genius, he showed himself a successful imitator of his great predecessors. His composition was good, his expression pleasing, his touch judicious, and his colouring agreeable. He was acquainted with history, architecture, and perspective, and used his knowledge skilfully in his pictures. The good taste which prevails in all his works is remarkable. His chief works are in Rome. He also etched successfully, among other things, the life of the Virgin Mary, in ten parts.

MARBLE, the name given to certain varieties of limestone capable of receiving a brilliant polish, and which, both from their durability and the beauty of the tints of many of them, have at all periods of the world been greatly in request for the purposes of art or architectural ornament. It is a pure carbonate of calcium. In giving a short but universal character of marble, it may be said that it effervesces with dilute nitric acid, and is capable of being scratched with fluor spar, while it easily marks gypsum. These properties will separate it at once from the granites, porphyries, and silicious pudding-stones with which it has been confounded, on one side, and from the gypseous alabaster on the other. From the hard rocks having been formerly included under the marbles comes the adage, 'hard as marble.' Marbles have been treated of under various divisions by different writers. The most frequent division has been that into two great sections—*primitive* marbles, which have a brilliant or shining fracture, and *secondary* marbles, or those which are possessed of a dull fracture. This classification has grown out of the idea that the former class is of more ancient origin—an opinion which the deductions of geology for the most part sufficiently confirm, though occasionally we find a marble of a compact and close texture in old rocks, and, on the other hand, those which are highly crystalline in

very recent formations. Dambenton has founded a classification of marbles upon the colours which they present, those of a uniform colour forming one class, those with two colours another, those with three shades a third, and so on. The best classification of these substances, however, is that of M. Brard, which divides all marbles into seven varieties or classes, viz. 1, *marbles of a uniform colour*, comprehending solely those which are either white or black; 2, *variegated marbles*, or those in which the spots and veins are interlaced and disposed without regularity; occasionally this variety embraces traces of organic remains; when these are disposed in star-like masses they are sometimes called *madrepore marbles;* 3, *shell marbles*, or those which are in part made up of shells; 4, *lumachelli marbles*, or those which are apparently wholly formed of shells; 5, *cipolin marbles*, or those which are veined with green tale; 6, *breccia marbles*, or those which are formed of angular fragments of different marbles, united by a cement of some different colour; 7, *pudding-stone marbles*, or those which are formed of reunited fragments, like the breccia marbles, only with the difference of having the pebbles rounded in place of being angular. By ancient or *antique marbles* is understood those kinds made use of by the ancients, the quarries of which are now, for the most part, exhausted or unknown. Of these we may mention the following:—

Parian marble. Its colour is snow-white, inclining to yellowish-white; it is fine, granular, and when polished has somewhat of a waxy appearance. It hardens by exposure to the air, which enables it to resist decomposition for ages. Dipœnus, Scyllis, Malas, and Micciades employed this marble, and were imitated by their successors. It receives with accuracy the most delicate touches of the chisel, and retains for ages, with all the softness of wax, the mild lustre even of the original polish. The finest Grecian sculpture which has been preserved to the present time is generally of Parian marble, as the Medicean Venus, the Diana Venatrix, the colossal Minerva (called *Pallas of Velletri*), Ariadne (called *Cleopatra*), and Juno (called *Capitolina*). The Arundelian Marbles at Oxford are of Parian marble.

Pentelican marble, from Mount Pentelicus, near Athens, resembles very closely the preceding, but is more compact and finer granular. At a very early period, when the arts had attained their full splendour in the age of Pericles, the preference was given by the Greeks, not to the marble of Paros, but to that of Mount Pentelicus, because it was whiter, and also, perhaps, because it was found in the vicinity of Athens. The Parthenon was constructed entirely of Pentelican marble. Among the statues of this marble in the Royal Museum at Paris are the Torso, a Bacchus in repose, a Paris, the throne of Saturn, and the tripod of Apollo.

Carrara marble is of a beautiful white colour, but is often traversed by gray veins, so that it is difficult to procure large blocks wholly free from them. It is not subject to turn yellow, as the Parian. This marble, which is almost the only one used by modern sculptors, was also quarried and wrought by the ancients. Its quarries are said to have been opened in the time of Julius Cæsar.

Red antique marble (*rosso antico* of the Italians, *Egyptium* of the ancients). This marble, according to antiquaries, is of a deep blood-red colour, here and there traversed by veins of white, and if closely inspected appears to be sprinkled over with minute white dots, as if it were strewed with sand. Another variety of this marble is of a very deep red without veins, of which a specimen may be seen in the Indian Bacchus in the Royal Museum of Paris.

Green antique marble (*verde antico* of the Italians) is an indeterminate mixture of white marble and green serpentine. It was known to the ancients under the name *marmor Spartanum* or *Lacedæmonium*.

African breccia marble (*antique African breccia*). It has a black ground, in which are imbedded fragments or portions of a grayish-white, of a deep red, or of a purple wine colour. This is said to be one of the most beautiful marbles hitherto found, and has a superb effect when accompanied with gilt ornaments. Its native place is not known with certainty; it is conjectured to be Africa. The pedestal of Venus Leaving the Bath, and a large column, both in the Royal Museum in Paris, are of this marble.

MARBLEHEAD, a seaport and township, United States, Massachusetts, 18 miles north-east from Boston, on a rocky point projecting 3 or 4 miles into Massachusetts Bay. It has a safe harbour, easy of access, and admitting vessels of the largest size. The town has recently become a favourite watering place. The inhabitants are extensively engaged in the cod fisheries. The manufacture of shoes is carried on to a considerable extent. Pop. 7467.

MARBLING, in bookbinding, a process of ornamenting the edges of books. After the edges of the book have been cut by the plough (see BOOKBINDING) the book is tied between two boards and taken to the trough. This is a vessel of about 2 inches deep, which is first filled with clean gum water. Various coloured pigments, ground in spirits of wine and mixed with a small quantity of ox gall, are thrown upon the surface of the gum water, and disposed in various forms with a quill and comb, according to the required pattern. This being obtained, the edges of the book are dipped into the trough, and the colours adhere. Cold water is then dashed over the edges, which sets the colours and brings them out clear.

MARBURG, a town of Prussia in the province of Hesse-Nassau, capital of the district of Cassel, agreeably situated on the slopes of an acclivity above the Lahn, and on the Cassel-Frankfurt Railway, 46 miles north from Frankfurt. The houses are in general poorly and irregularly built, and the streets are narrow and dirty. The principal buildings are the castle of the landgraves of Hesse, an ancient edifice, now partly used as a prison; the university, the first founded in Germany after the Reformation, and attended by about 800 students; the church of St. Elizabeth, built in the thirteenth century, and affording a pure specimen of the pointed Gothic; the chancery, library, and town-house. The manufactures consist chiefly of earthenware, leather, iron and tin wares, tobacco, wine, and beer. Marburg is the seat of several courts and public offices. The university possesses an observatory, chemical laboratory, mineralogical cabinet, anatomical theatre, and botanical garden. Marburg early embraced the Reformation, and makes a considerable figure in its early history. Here Luther and Zwingli held a conference in presence of the landgrave, with a view to terminate their unhappy differences on the subject of the Lord's supper. Pop. 11,225.

MARCELLINUS. See AMMIANUS MARCELLINUS.

MARCELLUS, M. CLAUDIUS, the first Roman general who successfully encountered Hannibal in the second Punic war. During his consulship (B.C. 222) he had given the greatest proofs of his valour, having slain in single combat, when at the head of an army, Britomartus or Viridomarus, a Gallic chief, thus gaining what were called the *spolia opima* (arms and armour of a leader slain by another leader). The Gauls, discouraged by the loss of their leader, fled before an inferior Roman force. The result of this victory was the complete conquest of Upper Italy.

Marcellus received the honour of a triumph. Soon after this the second Punic war broke out, and after the fatal battle of Cannæ (216) he was sent against Hannibal; and as prætor took the command of the troops remaining at Canusium. On receiving information of Hannibal's march to Nola he hastened to anticipate him, threw himself into the city, and forced the Carthaginians to retreat with a loss. Hannibal made a second attack upon Nola, and as the place was untenable Marcellus resolved to risk a general engagement on the open plain. After a hard-fought battle Hannibal was driven to his camp. Marcellus was now chosen consul, with the celebrated Fabius Maximus Cunctator for his colleague. He frustrated a third attempt of Hannibal to regain the city of Nola, and again offered him battle, which the latter declined. He afterwards went to his province of Sicily, where the siege of Syracuse was his most remarkable achievement. After having used every means (B.C. 214) to capture by force that city, which was defended by the mechanical ingenuity of Archimedes, he limited himself to a blockade, and frustrated all the efforts of the Carthaginians to relieve it, and succeeded, partly by artifice and partly by force, in making himself master of the place (B.C. 212). Many of the inhabitants, and among them Archimedes, were killed in the heat of victory. Marcellus was filled with regret on account of the death of Archimedes, granted many privileges to his connections, and caused him to be buried with much pomp. After having reduced the greater part of the island, and gained a complete victory over the Carthaginians, he returned to Rome, and received the honour of an ovation. He was again made consul (B.C. 211), with M. Valerius Lævinus, and again received the command in Sicily. But the Syracusans sent ambassadors to Rome to complain of his cruelty, and pray for another general. Marcellus was acquitted, but he voluntarily exchanged provinces and remained in Italy. He carried on the war against Hannibal in Italy, and was defeated by him at Canusium; but he renewed the contest on the following day, and gained the victory, though with a heavy loss. In B.C. 208 he was chosen consul the fifth time, with T. Quintius Crispinus. He was killed in a skirmish the same year. His family continued to flourish, and furnished many consuls, until it became extinct with the son of Octavia, the sister of Augustus, whom Virgil has immortalized.

MARCET, MRS., a well-known authoress, whose educational works for the young form so attractive an introduction to various sciences, was of Swiss origin, her father being a merchant of that country settled in London. Her maiden name was Haldimand, and she was born about 1768. She was married to Dr. Alexander Marcet, the eminent physician, a native of Geneva, but naturalized in Great Britain, who died in 1822. Among Mrs. Marcet's writings may be mentioned more especially her celebrated Conversations on Chemistry, Conversations on Natural Philosophy, and Conversations on Political Economy. They are written in a simple style, to suit the capacities of young persons, but have received unqualified praise from such authorities as Macaulay, Faraday, and others. She died on 5th July, 1858.

MARCH, a market town, England, in the county of Cambridge, and 29 miles north-west from the city of that name, on both sides of the Old Nene. There is a junction of five railways at this town. Its two principal streets cross each other at right angles, and are each nearly 2 miles long. The town generally is irregularly laid out, houses mostly of brick, and some well built; a good square market-place in the centre. The places of worship are four handsome Established churches and several Dissenting chapels. There are several board schools, together with a grammar-school. Pop. (1881), 6190.

MARCH (Latin, *Mars*), originally the first month of the Roman year; so named, according to tradition, by Romulus in honour of his father Mars. Till the adoption of the new style in Britain (1752), the 25th of March was the first day of the legal year; hence January, February, and the first twenty-four days of March have frequently two years appended, as January 1, 170½, or 1701–2. See CALENDAR.

MARCH, a movement by regular steps in the manner of soldiers; also a journey performed by a body of soldiers either on foot or on horseback. Soldiers on a march are subject to certain rules very necessary to keep them in good order, and fit to meet the enemy. The march in the first sense of regular step differs on different occasions. In the parade-march from seventy-five to ninety-five steps, each of about 30 inches, differing in different armies, are made in a minute; in the quick-march from 108 to 115 steps; and in the double quick 150 running paces. This last cannot be sustained for any length of time, and is only used in a charge, or in storming a commanding position, and in a few internal movements of regiments.

March further signifies the music composed for such movements; it is composed in $\frac{4}{4}$ or $\frac{2}{4}$ time for the parade-march, and in $\frac{6}{8}$ for quick-time. There are many sorts of such marches for festivals, funerals, &c., varying according to their different purposes.

MARCHE, one of the ancient provinces of France, bounded north by Berry and the Bourbonnais, east by Auvergne, and south by Guienne and Limousin. Its name is derived from its having been on the frontier of these provinces, and it was often called *Marche de Limousin*. In the middle ages it had for some time its own sovereign counts. Philippe le Bel acquired it by confiscation. It afterwards belonged to the house of Armagnac, and that of Bourbon-Montpensier. Francis I. finally united it with the crown domains.

MARCHENA, a town, Spain, Andalusia, province of Seville, and 30 miles east by south from the city of that name, in a sandy valley, and upon two hills. It is well built; retains some vestiges of its ancient tower-flanked walls; and has some fine squares, and clean and paved, though, for the most part, crooked and steep streets. Its public buildings are, three parish churches, several chapels, town and court house, prison, two hospitals, an orphan asylum, college, storehouse, three convents, and a palace of the dukes of Arcos. It has manufactures of linen, serge, and cloth, earthenware, soap, wine, and oil, and carries on some trade with Seville. Pop. 13,768.

MARCHES (from the Teutonic *mark*, boundary, through the French), the frontiers of a state. Thus, in English history we read of the lords of the Welsh marches, that is, of the frontiers of England and Wales; the marches of Scotland were divided into west and middle marches. The office of the lords marchers was originally to guard the frontiers. (See MARQUIS.) The corresponding word in French is *marche* (see MARCHE), in German *mark*, in Italian *marca*. In the Estates of the Church was a province called *Marca*, divided into the March or Marquisate of Ancona, and that of Fermo. In the Venetian territory was the *Marca Trevisana*. In Germany the Mark of Brandenburg, or the electoral mark (Kurmark), was divided into the Mittelmark, Neumark, Altmark, Vormark, and Ukermark. So Steiermark (Marquisate of Styria), Danemark (Denmark). See MARGRAVE.

MARCHES, THE, a territory now included in the Kingdom of Italy, but formerly constituting one of

the legations of the Papal States, comprises the region lying between the Apennines and the Adriatic, and is divided into six provinces—Urbino and Pesaro, Ancona, Macerata, Fermo, Camerino, and Ascoli. It receives its appellation from the circumstance of its having in former times bordered on the Duchy of Urbino in the north, and the Kingdom of Naples in the south.

MARCION, the founder of an ascetic Gnostic sect, called after him Marcionites, was born at Sinope about the beginning of the second century of our era. He was a son of the Bishop of Sinope, but appears to have reached the age of manhood before his father's conversion to Christianity and subsequent preferment. In his earlier years he was a sailor or ship-master. He seems to have become a Christian at a mature age from sincere conviction, and gave up to the church most of his wealth; but so much of error had got mixed with his opinions that he was excommunicated by his father. Expecting that his views would meet with a better reception at Rome he set out for that city, but was there a second time excommunicated. He attached himself while there to the Gnostic teacher Cerdo of Antioch, and founded a system antagonistic in some respects to Christianity. This system is, however, but imperfectly known. Its principal feature was the irreconcilable opposition which it supposed to exist between the Creator and the Christian God, and between the religious systems, the law and the gospel, which it believed they respectively founded. The sect held the existence of three original principles—the supreme and invisible, whom Marcion called the Good; the visible God, the Creator; and the devil, or perhaps matter, the source of evil. Marcion could not perceive in nature, or in the Old Testament, the same love which was in the gospel of Christ. He accordingly made the Creator, the God of the Old Testament, the author of suffering. Jesus was not the Messiah promised by this being, but the son of the unseen God, who took the form, but not the substance of man. Marcion denied the resurrection of the body; he condemned marriage, thinking it wrong to increase a race born in subjection to the harsh rule of the Creator. He rejected the whole of the Old Testament, and of the New all except a few epistles and a mutilation of the Gospel of Luke. He was vigorously attacked by Tertullian and others, who have, however, frequently misinterpreted his views, and maligned his character.

MARCOMANNI, MARKOMANNI, that is, borderers (see MARCHES), a powerful league of ancient German nations. After Cæsar's death they lived between the Danube and the Rhine. After the Romans had conquered Noricum and Pannonia, and had become dangerous to the Marcomanni from their proximity, the latter retired under their king, Maroboduus, made themselves masters of the Kingdom of the Boii, in the present Bohemia, called by the ancient Germans *Bojenheim*. By artifice and violence Maroboduus soon formed a union of a number of tribes under his sovereignty, and became dangerous to the Romans, as this league could bring 70,000 disciplined troops into the field. The Romans were prevented from attacking him by an insurrection of the Pannonians, for which reason Tiberius concluded a treaty with him, A.D. 6; but he was defeated by the Cherusci under Hermann (Arminius), A.D. 19. The same was the fate of his successor, the Goth, Catualda. Both fled to the Romans, who assigned them Ravenna and Aquileia for a residence. Relations of Maroboduus now governed the Marcomanni, who avoided all hostilities against the Romans till the time of Domitian. They subsequently made incursions into the Roman territory. Trajan and Hadrian held them in check. They invaded Pannonia (A.D. 166). After a long conflict, which is celebrated in Roman history under the name of the *Marcomannic war*, Marcus Aurelius (Antoninus) drove them back beyond the Danube. Commodus purchased peace in 180, which they observed, however, only so long as they were paid tribute, or Rome had a resolute ruler. They devastated Noricum and Rhætia, and even advanced through the passes of the Alps. Under Aurelian, in 270, they filled all Italy with consternation. But in the fifth century the name of Marcomanni disappeared. After the overthrow of the dominion of the Huns, the Rugii, Heruli, Scyri, Turcelingi made their appearance in the countries of the former Marcomanni.

MARCO POLO. See POLO.

MARCUS AURELIUS. See ANTONINUS.

MARCUS GRÆCUS, a pyrotechnist and alchemist, with regard to whose life nothing is known. As to the period at which he lived nothing else can be determined than that it must have been not later than the eleventh century, since he is cited by an Arabian physician of that date. The National Library at Paris possesses two manuscript copies of a small treatise, entitled Liber ignium ad comburendos hostes, auctore Marco Græco, one of which appears to belong to the fourteenth and the other to the fifteenth century. In this treatise there is an account of an explosive substance the ingredients entering into the composition of which are the same as those used in making gunpowder, although they are differently proportioned; so that it is not improbable that Schwartz, the reputed inventor of gunpowder, did nothing more than experiment on the receipts of Marcus Græcus. The treatise also contains the first account that has come down to us of the method of making what is called Greek fire. The following is the account given of it:—Take pure sulphur, tartar, sarcocol, pitch, melted saltpetre, oil of petroleum, and oil of turpentine; boil them well together; then steep some tow in the mixture, and set fire to it; the fire will communicate itself to everything, and nothing will be able to extinguish it except wine, vinegar, or sand.

MARDIN, a town, Asiatic Turkey, in the pashalic and 335 miles north-west of Bagdad, on a lofty limestone rock, at an elevation of 2300 feet, overlooking a large and fertile plain. It is substantially built, and apparently prosperous, and has among its principal edifices a large and handsome bazaar, numerous churches, and the ruins of an old castle. The Arabesques on the gate of the citadel are reported to be finer than those of the Alhambra. The Jacobite monastery in the neighbourhood possesses the largest library among the Syrians. Pop. about 15,000.

MAREE, LOCH, a Scottish lake in the west of Ross-shire, forming a long and comparatively narrow expanse, stretching south-east to north-west for 18 miles, with an average breadth not exceeding 1½ mile. Owing to its depth, which in most places is 60 fathoms, it has never been known to freeze. The scenery along its shores is of the boldest description, and its surface is studded with twenty-four wooded islands, on one of which are found the remains of an ancient chapel, with a graveyard. The loch discharges itself into Loch Ewe by a small river of same name.

MAREMME, low swampy tracts of Middle Italy, extending along the west coast of Tuscany from the mouth of the Cecina to Orbitello; length, 92 miles; breadth, from 6 to 20 miles; area, about 1000 square miles. Formerly these regions were fruitful, healthy, and populous; but after the fifteenth century the neglect of the water-courses of the district allowed the formation of marshes, and now they generate tertiary

fevers, and present an aspect of dreary desolation during the summer months, when the inhabitants flee from the pestilential exhalations of the soil. In part of Tuscany efforts have been made to drain and plant some districts with trees; by this the evil has been lessened, but is far from being entirely removed. The arable land in the vicinity of the Maremme is extremely fertile; and in the most affected districts the soil is ploughed and the harvest gathered in by hired labourers from the mountains, and in their livid and emaciated faces may be seen the fatal action of the malaria. In winter, on the other hand, the Maremme are inhabitable, and afford a luxuriant pasturage for cattle, which graze in summer on the Apennines. The Pontine Marshes and the Campagna of Rome are similar districts.

MARENGO, a village in Italy, in the province of Alessandria, and so near the town of that name as to be considered one of its suburbs, celebrated for the battle of June 14, 1800. Bonaparte had passed the Alps between the 16th and 27th of May with 60,000 men. Melas, the Austrian general, discovered his danger too late. June 2d, Bonaparte had obtained possession of the fortress of Bardo, which commanded the entrance of the valley of Aosta; Murat advanced on Milan, Suchet took Nice, and Berthier defeated at Montebello the Lieutenant field-marshal Von Ott. June 13th, Desaix arrived from Egypt at the head-quarters of Bonaparte; the main body of the army was concentrated at Marengo. On the 14th the battle was fought. About noon the French columns under Lannes and Victor were compelled to retreat. The slow advance of the Austrians, and the false direction of their numerous cavalry, gave the remains of the French army time to rally behind the corps of Desaix, which the first consul had ordered to Novi, to cut off the enemy's retreat to Genoa, but which was now recalled in haste. Desaix had taken his position at St. Giuliano, on the left side of the road from Tortona to Alessandria, when Kellermann arrived with his brigade of cavalry. The infantry of Desaix was about 3000 or 4000 strong. Desaix was mortally wounded at the first attack. Behind the vineyards which covered him Kellermann saw 6000 Hungarian grenadiers break their ranks in pursuit of the French. He threw himself into the midst of the enemy, who, terrified by this unexpected attack, and thinking themselves surrounded, threw down their arms. The Austrian main body supposed that the enemy had received a powerful reinforcement, and fell back in haste and disorder to Alessandria. The Austrians lost 8000 killed and wounded, and 4000 prisoners; the French 6000 killed and wounded, and 1000 prisoners. This defeat led to the armistice of Alessandria, which gave France the possession of all Upper Italy.

MAREOTIS, or MARIOUT, a lake, Lower Egypt, separated from the Mediterranean on the west by the long narrow belt on which Alexandria stands, and communicating on the north with Lake Madieh. In the south-west it terminates in a long narrow creek, but the main expanse is about 28 miles long by 20 broad. It was at one time deep enough for inland navigation, and had its shores covered with beautiful gardens and vineyards; but having been cut off from the Nile, which supplied its water, had become towards the end of last century a mere pestilential swamp. During the siege of Alexandria the British let the sea into it, and it is again a lake.

MARE'S-TAIL CORAL. See ISIS.

MARFORIO, a colossal statue representing the river Rhine, or Danube, or Jupiter Pistor (it is still an open question which), in a lying posture, and standing in the court of a wing of the Capitol at Rome. The name Marforio is a corruption of *Martis forum* (the forum of Mars), in the entrance of which the statue originally stood. The Marforio is famous for having served, like the Pasquino, as the place where the Roman satirists placed their lampoons.

MARGARET, Queen of Denmark, Norway, and Sweden, called the *Northern Semiramis*, the daughter of Waldemar III., king of Denmark, was born at Copenhagen in 1353, and married to Hakon, king of Norway, in 1363. The talents, firmness, and beauty of the princess rendered her popular among her countrymen, and on the death of her father she succeeded in placing her son Olaf on the throne of Denmark. The death of her husband in 1380 put the government of Norway in her hands, and the plan of uniting the three kingdoms, which was favoured by the imbecility of the Swedish monarch, seems now to have occupied the mind of this princess. Olaf died in 1387, and Margaret, by her address, caused herself to be declared queen. Taking advantage of the domestic dissensions in Sweden, and flattering the nobles with the prospect of greater power, she raised a party in that country who recognized her as queen; and having defeated the troops of Albert, the Swedish king, and taken him and his son prisoners at Falkœping, she obtained possession of the throne. Looking forward to a permanent union of the three crowns, she endeavoured to effect her purpose by the celebrated Act of Union, or Treaty of Calmar (1397). She restored tranquillity at home, and was successful against the foreign enemies of her kingdom; but her peace was disturbed by the ingratitude of Eric, whom she had nominated her successor. She died in 1412, after having by her prudence, energy, address, and foresight, raised herself to a degree of power and grandeur then unequalled in Europe from the time of Charlemagne.

MARGARET OF ANJOU, daughter of Regnier, or René the Good, titular King of Sicily, was born at Pont-à-Mousson, in Lorraine, in 1425, and married in 1443 to the imbecile Henry VI. of England. By the marriage articles Maine was given up to her uncle Charles of Anjou, and this cession facilitated the conquest of Normandy by the French. The loss of this important province was attributed to Margaret, and the House of Commons accused Suffolk, the author of her marriage and the favourite minister of the queen, of high treason. He was banished the kingdom. In the war of the Roses, which soon began to desolate England, Margaret played a conspicuous and important part. She was for a long time the life of the Lancastrian party. She defeated the Duke of York, and, placing a paper crown on his head, exposed him at the gates of the city of York. In 1461 the princess defeated Warwick at St. Alban's, and her victories were always stained with numerous executions. The son of the late Duke of York, the gallant young Edward, soon appeared at the head of the Yorkists, who now became victorious. Margaret's army was annihilated at Towton, and Edward was declared king. The queen succeeded in obtaining assistance from Louis XI. of France, but was again defeated. After concealing herself in the wildest parts of the country, where she was often compelled to suffer the greatest privations, and even endured the greatest indignities from the lawless bands with which the distracted kingdom was then infested, the queen finally took refuge in France. It was not long before Warwick became embroiled with the young king, and determined to replace Henry on the throne. Edward was in turn obliged to escape to the Continent, but having obtained assistance from the Duke of Burgundy, reappeared in England after a few months, and defeated Warwick at Barnet on the very day that Margaret landed in England with her son, then eighteen years of age.

On hearing of the defeat and death of her champion, the courage of Margaret seemed for once to forsake her, and she took refuge in the monastery of Beaulieu. But her undaunted and masculine spirit again led her to the field. Having collected her partisans, the hostile forces met at Tewkesbury, and the Lancastrians were totally defeated. The queen and her son were made prisoners, and the latter, when led into the presence of the royal victor, was killed. Henry soon after died or was murdered in the Tower, and Margaret remained in prison four years. Louis XI. ransomed her for 50,000 crowns, and in 1482 she died.

MARGARET OF VALOIS, Queen of Navarre, sister to Francis I. of France, was born at Angoulême in 1492. She was brought up at the court of Louis XII., and married the Duke of Alençon in 1509, became a widow in 1525, and in 1527 was espoused to Henry d'Albret, king of Navarre. She joined with her husband in every effort to make their small kingdom flourish, by encouraging agriculture and the useful arts, and by improving knowledge and civilization. She was fond of reading, and had been led by curiosity to make herself acquainted with the principles of the reformers, to which she became partially a convert, and not only afforded protection to reformed divines, but used her influence with her brother Francis to the same purpose. She also read the Bible in the French translation, and framed mysteries for representation from the New Testament, which she caused to be performed at court. She wrote a work entitled Le Miroir de l'Ame pécheresse, printed in 1533, which incurred the censure of the Sorbonne. She underwent some ill treatment from her husband on this account, and might have suffered more but for the interposition of her brother Francis I., who was much attached to her, and in complaisance to whom she, externally at least, became more strict in her attention to the ceremonial of the ancient religion. It will appear extraordinary in the present day that a princess so contemplative and pious as Margaret of Valois should be author of a book of tales as free in their tendency as those of Boccaccio. Such is the Heptaméron, ou sept Journées de la Reine de Navarre, which was written during the gaiety of youth, but not printed until after her death. She died in 1549, leaving one child, Jeanne d'Albret, afterwards mother of Henry IV. In 1547 a collection of her poems and other pieces was printed under the title of Marguerites de la Marguerite des Princesses.

MARGARIN, a mixture of the others of the lighter fatty acids, such as palmitic, stearic, &c. See STEARIC ACID.

MARGARITA, an island belonging to Venezuela, in the department of Cumana, in the Caribbean Sea. It is about 20 miles from the mainland, of very irregular form, being reduced near the centre to a narrow isthmus, with a broad expansion on the east, and a smaller on the west. Its greatest length, east to west, is 37 miles; greatest breadth, about 20. The connecting neck of land which unites the two extremities of the island is a low swampy tract. Both portions of the island are rocky, and rise in some parts as high as 3000 feet above the sea. The coasts are rocky and very steep, but contain several harbours, the principal of which, Pampatar, lies on the south-east coast. Indian-corn, bananas, and ground provisions are raised, as are also small quantities of cotton, sugar, coffee, and cacao. Extensive turtle, herring, and sardine fisheries are carried on. It has several small towns or villages, the most considerable of which, Asuncion, is situated on the east side of the island. Margarita was discovered by Columbus in 1498. Pop. estimated at 18,000.

MARGATE, a seaport, municipal borough, and watering-place in England, in the county of Kent, 64 miles east by south from London, on branches of the London, Chatham, and Dover Railway, pleasantly situated at the northern extremity of the Isle of Thanet, partly on the acclivity of two hills and partly in the intervening valley. The older part of the town occupies the latter, in which is the market-place and two or three narrow streets: the new part is well laid out, and contains some good streets and squares. The principal buildings are the market, town-hall, theatre, Church Institute, Seamen's Rooms, and observatory: asylum for the deaf and dumb, sea-bathing infirmary, assembly-rooms, and several bazaars. The stone pier is a fine structure, upwards of 900 feet long, 60 feet wide at the broadest part, and 26 feet high, with a parapet of 4½ feet. A portion of this pier is partitioned off as an esplanade, elevated 7 or 8 feet above the general level. Besides this pier there is a new landing pier 1300 feet long and 20 feet wide, having at its extremity a large octagonal extension erected in 1877, which is a favourite promenade, and where steamers may land at any time. The church of St. John the Baptist dates from the 11th century, and possesses some fine brasses and monuments. The church of the Holy Trinity is a modern structure in the Early English style. The charities comprise Draper's Hospital, a free school which provides education for 400 children, and the Alexandra Philanthropic Home. There are several bathing establishments in the town, libraries, billiard and reading rooms, and other places of recreation and amusement. As many as 200,000 visitors, it is said, sometimes arrive during the season. Pop. in 1881, 16,050.

MARGRAVE (German, *Markgraf*, Count of the Mark; see MARCHES), originally a commander intrusted with the protection of a *mark*, or a country on the frontier. As early as the times of Charlemagne marks and margraves appear: for instance, the mark of Austria. The margraves stood immediately under the German kings and emperors, and not under the dukes in whose country the margraviate was situated; yet there were also some margraves dependent on dukes. In the twelfth century margraviates became hereditary, and at last the margraves acquired the rank of princes of the empire, and stood between counts and dukes in the German Empire.

MARIA LOUISA, second wife of Napoleon I., born in 1791, was the eldest daughter of the Emperor Francis I. of Austria by his second marriage with Maria Theresa, daughter of Ferdinand, king of Naples. Her marriage with Napoleon in 1810, after his divorce from Josephine, seemed to promise permanency to his dynasty and peace to the Continent, and her progress towards Paris through the different provinces of the kingdom formed a kind of triumph. In 1811 she bore him a son, to whom, even before his birth, Napoleon had destined the title of King of Rome. In 1813, during his absence at the war, he named her regent of the kingdom, but considerably limited her powers. After his overthrow she returned to Vienna, and remained there during the Hundred Days. In 1816 she received, with the title of imperial majesty, the Duchies of Parma, Piacenza, and Guastalla, and at a later period made a morganatic marriage with her chamberlain, Count Neipperg. She governed her duchies generally with mildness, but did little for their prosperity, and cannot be said to have displayed the qualities either of a great or good sovereign. The latter part of her reign was much disturbed by revolutionary outbreaks and the very violent means taken to repress them. She died at Vienna in 1847, and was succeeded, according to

previous arrangement, by the Duke of Lucca, the Bourbon Charles II.

MARIANA, JUAN, one of the first Spanish historians, was born at Talavera, 1537, devoted himself to the clerical profession, and entered the Society of the Jesuits. At the University of Alcala he acquired that pure taste and that eloquence which are found in his writings. He then journeyed, and taught theology for thirteen years with distinction in Rome, Sicily, and Paris, returning to the Jesuits' College at Toledo in 1574. He now wrote his Historia de Rebus Hispaniæ (first edition, Toledo, 1592), in elegant Latin, that the great deeds of his countrymen might become known to all nations. His tone is impartial, though he ardently loves Spain and admires Spanish virtue. Though a Jesuit he complains of Pope Alexander VI., and says that he caused Cæsar Borgia to leave the clerical order, contrary to all law, human and divine. Though a Spaniard he is not blindly prejudiced in favour of his king. He describes with sorrow the conquest of Naples; and his censure of Ferdinand is moderated only by considering his good qualities as personal, his bad ones as common to all princes. His freedom excited the suspicions of the Inquisition. He has not, however, much claim to originality and borrowed largely from Zurita. The great success of Mariana's work, and the fear of seeing it badly translated, induced the author to translate it into the Castilian idiom himself. Four editions of the translation appeared during his lifetime, each with corrections and additions. An English translation was made by Stephens, the continuator of Dugdale's Monasticon (London, 1699, folio). Mariana's famous essay De Rege et Regis Institutione exposed the author to much animadversion, and, eleven years after its publication, was condemned to be burned by the parliament of Paris as a revolutionary work, because it maintains that it is permitted to make away with a tyrant. This book is said to have instigated Ravaillac to assassinate Henry IV. of France. The original edition of this work has become very rare. Mariana dedicated his last years to his *scholia* on the Old and New Testament, the completion of which his infirmities prevented. Yet he caused them to be printed in 1619 at Madrid. He died in 1624.

MARIANA (or MARIANNE) ISLES. See LADRONES.

MARIA THERESA, Queen of Hungary and Bohemia, Arch-duchess of Austria, and Empress of Germany, daughter of the Emperor Charles VI., was born at Vienna, 1717, and in 1736 married Duke Francis Stephen of Lorraine (who in 1737 became Grand-duke of Tuscany, by virtue of the treaty of Vienna, Oct. 3, 1735). On the day after the death of Charles (Oct. 21, 1740) she ascended the throne of Hungary, Bohemia, and Austria, in accordance with the terms of the Pragmatic Sanction drawn up by her father in her favour; and, November 21, declared her husband joint ruler. She found the kingdom exhausted, the people dissatisfied, the treasury empty, and the army (with the exception of the troops in Italy) only 30,000 strong. The elector, Charles Albert of Bavaria, supported by France, laid claim to the Austrian hereditary territories, and the electors of Cologne and the Palatinate would, likewise, not acknowledge the succession of Maria Theresa. Her states were invaded at the same time by Frederick the Great, who soon made himself master of Silesia; Spain and Naples gained possession of the Austrian territory in Italy; and the French, Bavarians, and Saxons marched into Bohemia, carrying all before them. Charles Albert was proclaimed Archduke of Austria, and shortly after Emperor of Germany; and the young queen, in danger of losing all her possessions, now deeming herself no longer safe in Vienna, fled to Presburg, where she convoked the diet, and threw herself upon the sympathy of her Hungarian subjects. According to the well-known story she is said to have appeared before the magnates draped in the Hungarian costume, with a sword by her side, and her child in her arms, and made the following address:—'Abandoned by my friends, persecuted by my enemies, attacked by my nearest relations, I have no other resource than in your courage, fidelity, and my own constancy; I commit to your hands the child of your king, who looks to you for his safety.' Moved by the youth, beauty, and misfortunes of the queen, the nobles drew their swords and exclaimed, 'Moriamur pro rege nostro Maria Theresia' (Let us die for our king Maria Theresa). A rising in her favour was voted with enthusiasm, and troops were quickly raised, who, by their mode of warfare and their ferocity, spread terror at first through the ranks of their enemies. From the very outset of her career, too, Britain was her firm ally, and lent her hearty support. It was not long until her enemies quarrelled amongst themselves. Prussia made a secret peace with the queen, who unwillingly abandoned Silesia and Glatz to Frederick. By the treaty of Aix-la-Chapelle (October, 1748) she was also compelled to give up the duchies of Parma, Piacenza, and Guastalla to Spain, while on the other hand her husband was elected emperor. During the time of peace which followed Maria Theresa made great financial reforms; agriculture, manufactures, and commerce flourished, the national revenue greatly increased, and the burdens were diminished. She held the reins of government herself, but placed much reliance on the counsels of her husband, and above all on the wise and energetic minister Kaunitz. Meanwhile a powerful league had been quietly formed by Austria, Russia, Saxony, and Sweden, against Frederick, whose estates were to become the prey of the allies. The Prussian monarch, determined to anticipate his enemies, marched into Saxony in 1756, and began the Seven Years' war. This again reduced Austria to a state of great exhaustion, but on its conclusion the empress renewed her efforts to promote the prosperity of the nation, ameliorating the condition of the peasantry, and mitigating the penal code. Her son Joseph was elected King of the Romans in 1764, and on the death of her husband, in 1765, she associated the young prince with herself in the government of her estates, leaving little, however, in his charge except the management of military affairs. In 1772 she joined Frederick of Prussia and Catherine of Russia in the dismemberment of Poland, obtaining Galicia and Lodomeria as her share of the spoil. The Porte also gave up to her Bukowina in 1777. About this time the death of the Elector of Bavaria produced the Bavarian war of Succession, out of which Austria emerged with the gain of the Inn valley (by the Peace of Teschen, 1779); but on the other hand the Austrian influence in Germany was sensibly lessened by the formation of the *Fürstenbund*, or League of the German Princes. Maria Theresa died 29th November, 1780. Throughout her reign she displayed an energetic and masculine character, and raised Austria to a height of power such as it had never previously attained. Although a strict Roman Catholic, she abolished the right of asylum in churches and convents, suppressed the Inquisition in Milan, forbade the presence of priests at the making of wills, expelled the Jesuits from all her estates, prohibited individuals of both sexes from entering convents before the age of twenty-five, and made the use of the rack illegal. She founded and improved universities, academies, and schools, encouraged agriculture, and rewarded those who made any important improvements in the arts. When young she was one of the

handsomest women of her time, in advanced age she became very corpulent. Of the sixteen children which she bore to the emperor ten survived her, one of whom was the unfortunate Marie Antoinette.

MARIA-THERESIOPEL. See THERESIOPEL.

MARIA-ZELL, a small market town of the Austrian Empire, in the extreme north of Styria, in the midst of mountains, near the Salza. It is a mean-looking place, but has acquired great celebrity from its possession of a handsome church, with a shrine, to which eighty pilgrimage processions proceed annually from different parts of the Austrian dominions. The number of pilgrims yearly has been estimated at 300,000; and the object which attracts them is a rudely-carved piece of lime-tree wood, painted black, and about 18 inches high, intended to represent the Virgin and Child, who are clothed in the costliest stuffs, and almost buried under gems and ornaments of immense value. The inhabitants drive a lucrative trade in relics, rosaries, and similar articles, supposed to have derived virtue from having been in contact with the image. Pop. about 1200.

MARIE ANTOINETTE. See ANTOINETTE.

MARIE GALANTE, an island in the West Indies, belonging to France, 5 leagues from Guadaloupe. The chief productions are sugar, coffee, tobacco, indigo, and cotton. Pop. 15,017, chiefly negroes. It is a dependency of Guadaloupe. Columbus discovered it in 1493, and named it from his vessel. The French occupied it in 1647, and have lost it several times. In 1825 it suffered severely from the hurricane which desolated Guadaloupe.

MARIENBAD, one of the most frequented and picturesque of the Bohemian watering-places, in the circle of Eger, in a kind of triangular basin formed by several mountain-ranges, about 24 miles from Carlsbad. The village consists of over 100 buildings, chiefly lodging-houses, built like a crescent on a slope, surrounded with woods of pine and fir trees, except in front. The Kursaal is a magnificent establishment, and is provided with all the usual appurtenances of assembly-rooms, theatre, &c. The springs are of two kinds—the Kreuzbrunnen, which are saline and purgative; and the Ferdinand's-brunnen, which contain less salt but much more carbonic acid. They are used in the form both of mud, vapour, and gas baths; the latter derived from a peat-bog, which emits enormous quantities of carbonic acid gas. By a peculiar apparatus the whole person of the patient, or only the particular part affected, can be exposed to the gas, and, it is said, with very beneficial effect. Great quantities of the water, from both kinds of springs, are exported. Pop. 2009.

MARIENBURG, a town in Prussia, in the government of Danzig, and 27 miles south-east of the city of that name, on the Nogat, over which there is both a railway bridge and a bridge of boats. It was once the seat of the knights of the Teutonic order, from whom the Prussian monarchy may be said to have sprung; and contains the castle or palace of the grand masters, an imposing edifice, in a peculiar style of Gothic with a splendid apartment called the chapter-house, and a remarkably chaste church. The manufactures consist of woollen, linen, and cotton cloth, hosiery, hats &c. The trade is in corn and wood. Pop. 9559.

MARIENWERDER, a town of West Prussia, capital of the government of same name, on a height, 43 miles S.S.E. of Danzig. It consists of the town proper and four suburbs, is well built, and has an ancient and handsome cathedral, with a lofty tower, finely painted glass, and tombs of the Teutonic knights; an old castle, partly used as a court-house and partly used as a prison; a gymnasium, two asylums, and an hospital. The manufactures are woollen and linen cloth, leather, hats, beer, brandy, &c. Pop. in 1880, 8238.—The government, area 6770 square miles, consists for the most part of an extensive flat, occasionally broken by low hills, and watered by the Vistula or its tributaries. The arable land has some rich alluvial tracts, but most of it is only of indifferent fertility. Large tracts are covered with forests, and others are devoted to pasture. Pop. in 1880, 836,717.

MARIGNANO, or MELEGNANO, a town of Italy, Lombardy, in the province and 10 miles south-east of Milan, near the left bank of the Lambro, here crossed by a bridge. It has a court of justice, several public offices, three churches, and some trade. In 1279 a peace was concluded here between the Guelfs and the Ghibellines; and in 1515 Francis I. here defeated the Imperialists. Pop. 4164. See FRANCIS I.

MARIGOLD (*Calendula officinalis*), of the natural order Compositæ, and sub-order Corymbiferæ, is a native of France and of the more southern parts of Europe. It is an annual, from 1 to 2 feet high, has its stem erect, with large deep-yellow flowers, and the lower leaves obovate on long stalks. It has been a denizen of British gardens from the earliest times. It is common, hardy, and as prolific as any weed, and was formerly used in broths and soups, partly to give them a colour, and partly to give the peculiar flavour and warm aromatic taste which belong to the flower. It had also many medicinal virtues assigned to it, which modern experience has not confirmed. Linnæus says that the flower of the marigold is open from nine in the morning till three in the afternoon. There are double, lemon-coloured, and prolific varieties. A distilled water, a kind of vinegar, and a conserve are prepared from the flowers. A number of species of this genus are indigenous to the Cape of Good Hope. The African marigold, and the French marigold, common in flower borders, are both Mexican species, and have brilliant flowers. The African marigold is said to indicate meteorological changes. If it continues shut after seven o'clock in the morning rain may be soon expected. The marsh-marigold has no botanical affinity with the true marigold. See MARSH-MARIGOLD.

MARINE LAW. See COMMERCIAL LAW.

MARINES, a military force drilled as infantry, whose especial duty is to serve on board ships of war when on commission, and also on shore under certain circumstances. They are trained to seamen's duties, which they sometimes assist to perform, especially in the British service. The force was first embodied by an order in council of 16th October, 1664, as a nursery for seamen to man the fleet. The Duke of York's maritime regiment of foot is mentioned in 1684; and several regiments, which, however, were subsequently disbanded, were placed on the establishment in the reign of William III. So conspicuous was their utility that in 1741 the force consisted of 10,000 men, and in 1759 of 18,000. The number was increased during the great French war to above 30,000, but on the conclusion of peace there was a large reduction. The number of marines provided for the naval service in the estimates for 1873–74 was 14,000, 8000 of whom were to be afloat, and 6000 on shore. The Admiralty has the sole government of the force. When serving on board ship their discipline is regulated by the Naval Discipline Act, 29 and 30 Victoria, cap. civ.; and when on shore by an act annually passed, called the Marine Mutiny Act. The men, who are clothed and armed in the same manner as the infantry of the line and artillery respectively, act as sharp-shooters in time of action, and at other times supply sentries to guard the stores and gangways. The force is divided into four divisions of light infantry and one of artillery. Commissions go with seniority, from the rank of

lieutenant to that of general, and the corps takes rank between the 49th and 50th regiments of foot. The term of enlistment is 12 years. The colours bear the word 'Gibraltar,' as the corps distinguished itself in the defence of that fortress. The United States is the only other nation which employs marines in the same manner as Britain.

MARINI, GIAMBATTISTA, an Italian poet, the founder of the Marinist school, was born in October, 1569, at Naples. Against the wish of his father, who intended him for the study of the law, he followed his inclination for poetry. The Duke of Bovino took him into his palace, and the Prince of Conca, high admiral of the kingdom, into his service. Here he became acquainted with Torquato Tasso, and in intercourse with him his powers were developed. At a later period he found a patron in the Cardinal Pietro Aldobrandini at Rome, with whom he went to Turin, where a flattering poem on the Duke of Savoy, Charles Emmanuel, entitled Il Ritratto, procured him a kind reception, an order, the title of the duke's secretary, &c. The envy of his enemies and his satirical humour involved him in various disputes. Margaret, the divorced wife of Henry IV., had invited him to Paris. After her death Maria de' Medici became his patroness there. He showed his gratitude in a poem—Il Tempio—for which new rewards were bestowed upon him. Towards the end of 1622 he returned to Italy, was elected president of the Accademia degli Umoristi at Rome, and after some time proceeded to his native place. Here he chose Posilippo for his residence, and hoped to enjoy the fortune he had acquired; but he died 25th March, 1625. Marini's most famous work, the epic Adone, was first published in Paris, 1623, and has been equally praised and blamed, both for its plan and execution. The voluptuousness of many passages has placed it among the prohibited books. The other works of Marini are a narrative poem La Strage degli Innocenti, and a great collection of miscellaneous poems (published at various times, under the titles of La Lira, and La Zampogna); also Lettere grave, argute, facete, and other compositions in prose and verse. Some of his sonnets are among the most perfect in the Italian language. He is the founder of the Marinist school of poetry, of which false over-strained imagery, far-fetched metaphors, and forced conceits are the essential features. Nature endowed him with the gifts of a poet, but the faults of the master became insupportable in his followers, who could imitate indeed his conceits but could not redeem them by flashes of genius.

MARINO, a market town of Central Italy, 13 miles south-east of Rome, and a little north of Lake Albano. It has a castle, cathedral, baronial palace, many churches, a college, public hospital, and numerous antiquities. Pop. 6000.

MARINO, SAN, a town and small republic in Italy. The republic consists of a craggy tract, with an area of about 17 square miles, of a nearly circular form, on the borders of the provinces of Forli and Urbino, near the Adriatic coast. It is the last surviving representative of the Italian republics, and not so much by following as by lagging behind the improvements of the time, has preserved its independence for fourteen centuries. By its constitution, which is unwritten, the legislature consists of a general council (Generale Consiglio Principe), of sixty, elected by the people, and the executive of two captains elected every six months, and superintended by twelve members of the general council, the 'Council of Twelve,' of which members two-thirds are changed every year. The judicial office is confided only to a stranger, who must be a doctor of laws, and holds office for not longer than three years. The army musters about forty men. The town San Marino occupies the crest of a rocky mountain 2200 feet in height, but the principal inhabitants reside in the hamlet of Il Borgo, at its foot, where shelter is obtained from the cold winds which blow over San Marino, and often keep it covered with snow when the low grounds are enjoying a comparatively warm temperature. The independence of the republic has been repeatedly threatened; at one time by the dangerous vicinity of the Malatesta of Rimini, at another by the intrigues of churchmen, and at another by Napoleon, who had issued a decree for its suppression, but was induced to rescind it, mainly by the magnanimous efforts of Antonio Onofri. The same patriot afterwards nobly pleaded its cause, and obtained its formal recognition by the Congress of Vienna. A marble bust in the council chamber and an inscription on his tomb gratefully record his services, and justly award him the title of 'Father of his Country.' Pop. of the town, including Il Borgo, 1200; of republic in 1874, 7816.

MARIOLATRY (Greek *latreia*, adoration), the worship paid by Roman Catholics to the Virgin Mary. The term is meant to imply that Roman Catholics give to the Virgin the supreme worship of *latreia*, or adoration; but this they emphatically deny. As the mother of our Lord they give her *hyperdulia*, a worship higher than that of all other saints, but far short, they say, of *latreia*. The prayers addressed to the Virgin are understood merely as petitions for her intercession with her Son. They are expressions of reliance not on her power, but on the efficacy of her prayers to our Lord. See MARY.

MARIONETTES. See PUPPET-SHOWS.

MARIOTTE, EDME, a distinguished French mathematician and natural philosopher, born in Burgundy during the first half of the seventeenth century, served as priest at St. Martin-sous-Beaune, became member of the Academy of Sciences in 1666, and died 12th May, 1684. He was a most accurate experimenter, followed close in the steps of his predecessors Galileo and Torricelli, and made many important discoveries in hydrostatics and hydraulics. The law according to which the density of the atmosphere is regulated was discovered by him and Boyle independently. His collected works were published at Leyden in 1717, and the Hague in 1740.

MARIOTTE'S LAW, or BOYLE'S LAW. See AIR.

MARITIME LAW. See COMMERCIAL LAW.

MARITZA (the ancient *Hebrus*), a considerable river of Turkey, in the province of Rumili, formed by the junction of two principal head streams which flow from the south slopes of the Balkan Mountains, from sources about 40 miles apart. The junction of the streams takes place near Papazli, from which point the river flows south-east to Adrianople, where it bends to the south-west, and following this course, with pretty numerous windings, falls into the Ægean Sea by the Gulf of Enos. Its whole course, from the junction of the head streams to its mouth, is about 160 miles. By means of its tributaries it drains the greater part of the province.

MARIUPOL, a town and seaport, Russia, in the government and 150 miles south-east of Ekaterinoslav, on the north-west shore of the Sea of Azof, at the mouth of the Kalmijus, 60 miles west of Taganrog. The inhabitants, almost all Greeks whom the Empress Catharine II. transported, very much against their will, from the Crimea, carry on a considerable export trade in wheat, linseed, wool, and hides, for which their position gives them great facilities. The import trade is insignificant. Pop. 9774.

MARIUS, CAIUS, a distinguished Roman general, was born 157 B.C., of obscure parents, at the village

of Cereatæ, near Arpinum. He devoted himself to a military career, and gave the first proofs of his courage at Numantia (134 B.C.) under Scipio Africanus. During the consulship of Cæcilius Metellus and L. Aurelius Cotta (119 B.C.) he was made tribune of the plebs by the influence of the former; but he acted with such vigour in opposition to the nobles that they demanded an explanation of his motives. His decision, however, triumphed over consular and patrician opposition, and gained for him the favour of the people. He then stood candidate for the ædileship, but without success. He was, however, appointed prætor (115 B.C.) The office of proprætor of Spain was conferred on him the following year. He delivered the country from robbers, and on his return he again devoted himself to political affairs. By his marriage with Julia, the aunt of Julius Cæsar, he connected himself with the illustrious Julian family. In 109 B.C. he accompanied the Consul Q. Cæcilius Metellus as his lieutenant to the Jugurthine war. During its progress he hastened to Rome, and by the most extravagant promises gained over the minds of the people so completely that he was unanimously chosen consul, having L. Cassius Longinus as his colleague (107 B.C.) With the speed of lightning he appeared at Utica, and began the campaign. In the meantime Jugurtha had found an ally in Bocchus, king of Mauritania. Two armies opposed the Romans. Marius marched through the deserts of Numidia to Capsa, the capital, which he stormed and destroyed, and every place which he approached surrendered. While Marius was prosecuting the war L. Cornelius Sulla, the quæstor, arrived with a reinforcement of cavalry, and soon gained the friendship of his commander. Marius having defeated, almost to extermination, the combined forces of Jugurtha and Bocchus, the latter made his peace with the Romans, and was persuaded by Sulla to betray Jugurtha to them. Marius divided a part of Jugurtha's territory between Bocchus and Hiempsal II., and made the remainder a Roman province. Before his return to the capital he received the unexpected information that he was chosen consul the second time (104 B.C.) The people, terrified by the approach of the Cimbri and Teutones, had chosen him contrary to the laws. He marched over the Alps to Gaul, but the Cimbri and Teutones, instead of passing into Italy, had invaded Spain, and thus gave Marius an opportunity to discipline his army. He was made consul a third and fourth time in succession (103 101 B.C.), as it was felt that the safety of the republic depended on him alone. For more than two years he conducted the war in Transalpine Gaul against the Teutones and their allies. Finally he pursued and overtook them at Aquæ Sextiæ. He first attacked the Ambrones, and on the next day the Teutones, and destroyed both armies (B.C. 102). He now set himself to defeat the Cimbri, who had entered Italy on the east. Marius united his forces with those of the other consul Lutatius Catulus, and marched against them. The defeat of the barbarians was complete, and Marius and his colleague entered the city in triumph (B.C. 101.) The victorious general was appointed consul for the sixth time, but having in the meantime become an object of suspicion to both parties by his ambiguous conduct, on the next consular election he was not rechosen. Soon after this the Social War broke out, and this dangerous contest was hardly closed when the civil war arose between Marius and Sulla. They were both candidates for the command against Mithridates, which Marius received, but the army marched to Rome under his rival, and Sulla entered the city without resistance. Marius and his son fled, and were proscribed. Separated from his son, Marius wandered about on the coasts of Italy, and after escaping several times the pursuit of his enemies, and making numerous hair-breadth escapes, the people of Minturnæ, moved with compassion, conducted him to the coast, whence a vessel conveyed him to Africa. He landed amid the ruins of Carthage, and joined his son. When they received information that their party had once more triumphed in Italy by means of Cinna, Marius hastened to return. He attacked the city, and the senate offered to throw open the gates on condition that no Roman should be put to death without trial. Meanwhile Marius, with his infuriated followers, entered the city, and a dreadful massacre took place, to which Sertorius and Cinna finally put an end. Almost all the senators who were opposed to the popular party were put to death, and their estates confiscated. When the term of Cinna's consulship was completed he declared himself and Marius consuls. Marius was now seventy years of age, and enjoyed this dignity for the seventh time; but he died seventeen days after (B.C. 86).

MARJORAM (*Origanum*), a genus of plants of the natural order Labiatæ. The common marjoram (*Origanum vulgare*) is a native of Britain; it is a perennial under-shrub, growing among copsewood in calcareous soils. The leaves are small and acute; the flowers slightly red, and appear in July and August, in smooth clustered spikes. Sweet Marjoram (*Origanum marjorana*) is a biennial, having its flowers growing in close knotted-like heads. As soon as it blossoms it is cut and dried for winter use, as a culinary herb. Several species of marjoram are very agreeable aromatics, and diffuse a sweet and pleasant odour. Aromatic oils are also procured from them.

MARK. See MARCHES.

MARK, or MARC, denotes a weight used in several parts of Europe, and for several commodities, especially gold and silver. When gold and silver are sold by the mark it is divided into 24 carats.—Mark is also a term formerly used in England for a money of account, and in some other countries for a coin. The English mark was two-thirds of £1 sterling, or 13*s.* 4*d.*; and the Scotch mark, or *merk*, was two-thirds of £1 Scots, or 13½*d.* sterling. For the new German mark see GERMANY, section Money, Weights, and Measures.

MARK, ORDER OF ST., a Venetian order of knighthood, the origin of which is not known. The doge, as well as the senate, elected knights of St. Mark, who enjoyed a pension. Foreigners also, particularly scholars, were elected. St. Mark the Evangelist was the patron saint of the Venetian Republic.

MARK THE EVANGELIST, according to the old ecclesiastical writers, the person known in the Acts of the Apostles as 'John, whose surname was Mark' (Acts xii. 12, 25), was for many years the companion of Paul and Peter on their journeys. His mother, Mary, was generally in the train of Jesus, and her house at Jerusalem was open constantly for the reception of the apostles. Mark was himself present at a part of the events which he relates, and received his information partly from eye-witnesses. He was the cousin of Barnabas (Col. iv. 10), and accompanied Paul and him to Antioch, Cyprus, and Perga in Pamphylia. He returned to Jerusalem, whence he afterwards went to Cyprus, and thence to Rome. He was the cause of the memorable 'sharp contention' between Paul and Barnabas. His Gospel is plainly intended for Christian converts from paganism. It is not certain, however, whether it was first read at Rome or Alexandria, where he had established churches, or at Antioch. He is distinguished from the other evangelists by his brevity, passing over much that relates to the character of Christ as Messiah, which could be important only to Jewish con-

verts. The genuineness of his Gospel has never been questioned on any good grounds. He writes as an independent witness to the truth, and not as a compiler. It is probable that his gospel was written under the sanction of Peter, and that his matter was in some degree derived from him.

MARK ANTONY. See ANTONIUS.

MARKETS. See FAIRS.

MARKIRCH, or ST. MARIE-AUX-MINES, a town of Germany, in Upper Alsace, 20 miles north-west of Colmar. It extends above 1 mile in length, between two mountains, on both sides of the river, and is tolerably well built. It is the chief seat of the manufacture of coloured tissues; including, among other articles, cotton hosiery, cotton and woollen cloth, cravats of all sorts, ginghams, &c. It has also worsted, cotton, fulling, and paper mills; tanneries, and dye-works. Its trade is in cherry-brandy, paper, coloured cottons, cotton-twist, and the numerous articles of its manufacture. In its neighbourhood argentiferous lead was long worked to a great extent, but the mines are no longer in operation. Pop. (1880), 11,524.

MARL. Compact limestone, by increase of argillaceous matter, passes into marl. Marl is essentially composed of carbonate of lime and clay in various proportions. But some marls are more or less indurated, while others are friable and earthy. In some the argillaceous ingredient is comparatively small, while in others it abounds, and furnishes the predominant characters. The calcareous and argillaceous marls unite by imperceptible degrees, and the latter sometimes pass into clay. Marl frequently contains sand and some other foreign ingredients. Some divide marls into calcareous and argillaceous, the former of which is beneficially employed on clays, and the latter on sands; others into indurated and earthy. The hardness of indurated marl is inconsiderable. It has a dull aspect, like chalk or clay, often with a few glimmering spots arising from sand or mica. It occurs in masses, either compact or possessing a slaty structure. All solid marls crumble by exposure to the atmosphere, usually in the course of a year, but sometimes a longer period is requisite. The same changes generally take place in a very short time when the marl is immersed in water, with which it forms a short paste. It crumbles more easily, and forms a more tenacious paste, in proportion as it becomes more argillaceous. It is always more or less easily fusible. All marls effervesce with acids, sometimes very briskly and sometimes feebly, according to their solidity and the proportion of carbonate of lime, which may vary from 25 to 80 per cent. In the argillaceous marls it is often much less, varying from 6 to 20 per cent. Earthy marl differs from the preceding by being more or less friable, or even loose; but they gradually pass into each other. Like the indurated marl it may be either calcareous or argillaceous. Marl, like clay, belongs both to secondary and alluvial earths, where it occurs in masses or in beds. Hence it is found associated with compact limestone, chalk, gypsum, or with sand or clay. It contains various organic remains, as shells, fish, bones of birds and of quadrupeds, and sometimes vegetables. The organic remains are numerous and extremely interesting in the marly strata examined by Cuvier and Brogniart in the vicinity of Paris. Marl is found more or less in most countries, and in very different geological formations, and seems to owe its origin to deposition by water. Its most general use is as a manure. The fertility of any soil depends in a great degree on the suitable proportion of the earths which it contains; and whether a calcareous or an argillaceous marl will be more suitable to a given soil may be determined with much probability by its tenacity or looseness, moisture or dryness. To employ marls judiciously, therefore, the farmer should be in some degree acquainted with the chemical properties or constituent parts of the marl itself, and with the ingredients of the soil. He may, in general, determine the existence of marl by its falling into powder, when dried, after exposure to moist air. To ascertain the proportion of its ingredients the calcareous part may be extracted from a given weight of the marl by solution in acids, and the residue, being dried and weighed, will give the quantity of clay with sufficient accuracy. The quicker action and greater efficiency of slaked lime have in many districts led to its substitution for marl. See MANURES.

MARLBOROUGH, a parliamentary and municipal borough of England, in the county of Wilts, 71 miles west by south of London, on the left bank of the Kennet, a tributary of the Thames. It consists principally of one fine wide street, paved and lighted with gas, and having a piazza, known as the 'Penthouse,' running along its north side. The houses are irregular, but for the most part large and well built. The more modern are of brick or stone, but the older are constructed of wood, with curiously ornamented fronts. The market-house is an ancient building, over which is the town-hall. There are two parish churches, St. Peter's and St. Mary's, one at each end of the High Street; chapels for Independents, Wesleyans, and Primitive Methodists; a grammar-school, a college for the education of the sons of the clergy and others, opened in 1843, with handsome buildings (which have been subsequently added to from time to time) and attended by nearly 600 boys; a corn exchange, cottage hospital. A small trade is carried on in tanning and rope and sacking manufacturing. It has a weekly market, and some business is likewise done in corn, coal, and bacon. It sends one member to Parliament. Pop. in 1881 (mun. bor.), 3343; (parl. bor.), 5180.

MARLBOROUGH, a province, New Zealand, occupying the north-east district of South Island, and bounded by the sea and the province of Nelson. It is 130 miles in length by 60 in breadth, with an area of about 3,000,000 acres. At its northern extremity, where it is washed by Cook's Strait, separating it from North Island, it is deeply indented by a multiplicity of bays and natural harbours, from which the hills rise abruptly, clothed with magnificent forests. Queen Charlotte's Sound, the largest of these inlets, is capable of accommodating the whole British navy. The amount of arable land is somewhat restricted, but the soil is of the most fertile description. In the south of the province are the Wairau Plains, one of the finest sheep tracts in New Zealand. Capital, Picton, situated on an arm of Queen Charlotte's Sound. The pop. in 1881 was 9300.

MARLBOROUGH, JOHN CHURCHILL, DUKE OF, a distinguished general and statesman, was the second son of Sir Winston Churchill, and was born at Ashe, in Devonshire, 24th June, 1650. He received only a very imperfect education, and at the age of twelve was taken to court, and became page to the Duke of York, from whom at sixteen he received a pair of colours. The first engagement at which he was present was the siege of Tangiers, which seems to have decided him in his choice of a profession. On his return he remained for some time about the court, and rose to the rank of captain. In 1672 he accompanied the Duke of Monmouth, who went with a body of auxiliaries to assist the French against the Dutch. He there fought under the great Turenne, with whom he went by the name of the *handsome Englishman*. At the siege of Maestricht he distinguished himself so highly as to obtain the public thanks of the King of France. On his return to England he was made

lieutenant-colonel, and through the influence of his sister Arabella, mistress of the Duke of York, his advancement was rapid. He had a regiment of dragoons presented to him, and married Sarah Jennings, a lady of great beauty and good family, an attendant upon the princess, afterwards Queen Anne. By this union he materially strengthened his interest at court. In 1682 he obtained the title of Baron of Eyemouth, and a colonelcy in the guards. On the accession of James II. he was sent ambassador to France, and soon after his return was created Baron Churchill of Sundridge, and raised to the rank of general. The same year he suppressed the rebellion of the Duke of Monmouth. On the arrival of the Prince of Orange he joined him at Axminster, with the Duke of Grafton and some other officers. His conduct in this affair has been severely censured as ungrateful. On the accession of William and Mary in 1689 he was rewarded for his zeal in their cause by the earldom of Marlborough, and appointed commander-in-chief of the English army in the Low Countries. The following year he served in Ireland, where he reduced Cork, Kinsale, and other places. In 1691 he experienced a great reverse in his sudden dismissal from all his employments, followed by his commitment to the Tower on the charge of high treason. He soon obtained his release; but it appears that the suspicions against him were not altogether without foundation, and that a correspondence probably existed between him and Lord Godolphin, having for its object the restoration of the banished king. However this may have been, during the life of Queen Mary the earl seems to have kept away from court; and, aided by his countess, exerted great influence over the Princess Anne.

On the death of Queen Mary he was made a privy-councillor, and appointed governor to the young Duke of Gloucester; and in 1701 was created by King William commander-in-chief of the English forces in Holland, and also ambassador plenipotentiary to the States-General. Still greater honours awaited him on the accession of Queen Anne in 1702, when he was created captain-general of all the forces at home and abroad, and sent plenipotentiary to the Hague, where he was also made captain-general by the States. In the campaign of the same year he drove the French out of Spanish Guelders, and took several strong towns, among which was Liége, for which he received the thanks of both houses, and was created Duke of Marlborough. In June, 1704, he stormed the French and Bavarian lines at Donauwörth, and on August 13th of the same year, in conjunction with Prince Eugène, he gained the memorable and decisive victory of Blenheim over the French and Bavarians, headed by Marshal Tallard and the Elector of Bavaria. Tallard was taken prisoner, and the Electorate of Bavaria became the prize of the conquerors. The nation testified its gratitude to the duke by the gifts of the honour of Woodstock and hundred of Wotton, and erected a palace for him, one of the finest seats in the kingdom. Medals were struck in honour of the event, which Addison also celebrated in his poem of the Campaign. During the year 1705 he visited the courts of Berlin, Hanover, and Venice, and his conciliating manner, great prudence, and perfect command of himself contributed to render him as successful in his negotiations as in the field. The new emperor, Joseph, invested him with the title of *Prince of the Empire*, which was accompanied by a present of the Principality of Mindelheim. On the victory of Ramillies, May 23, 1706, which compelled the French to evacuate the whole of Spanish Flanders, a bill was passed to settle his honours upon the male and female issue of his daughters. He next visited the German courts in the alliance, and waited upon Charles XII. of Sweden, then in Saxony. In the campaign of 1707 his antagonist was the famous Duke de Vendôme, over whom he gained no advantage. On his return to England he found that the duchess was out of favour with the queen, and though he was received with the usual attentions, yet it was evident his popularity at court was on the decline. In 1708 (11th July), in conjunction with Prince Eugène, he gained the battle of Oudenarde, and pushed the victory so far that the French king entered into a negotiation for peace, which was of no effect. In 1709 (11th September) he defeated Marshal Villars at Malplaquet; but this action was attended with great slaughter on both sides, the allies losing 18,000 men, which loss was but ill repaid by the capture of Mons. On the next visit of the duke to England he found that the duchess, by her great arrogance, had so disgusted the queen that a total breach had ensued. Early in 1710 he returned to the army, and with Prince Eugène gained another victory over Villars, and took the towns of Douai, Aire, and St. Venant. During his absence a new ministry was chosen, composed of men hostile to him and his views, and on his return he was consequently expected to resign; but this he would not do, and dissembling his indignation again repaired to the field, and signalized himself by the capture of Bouchain (August, 1711). Finding that he would not resign his command, it was taken from him; and a prosecution was even commenced against him for applying the public money to private purposes. Disgusted by this gross ingratitude he repaired to the Low Countries, where he was received with the greatest honour. He returned a short time before the queen's death, and on the accession of George I. was restored to favour and reinstated in the supreme military command. Retiring from all public employments, his mental faculties gradually decayed, and he died at Windsor Lodge, 16th June, 1722, in the seventy-third year of his age, leaving four daughters, who married into families of the first distinction. His duchess, Sarah Jennings, born 29th May, 1660; died 29th October, 1744, has been almost equally celebrated for her boundless ambition and avarice. She left a fortune of £3,000,000 sterling. The only son of the Duke and Duchess of Marlborough having died while young, the title fell to the descendants of one of their daughters, the lady of Charles Spencer, earl of Sunderland, who have assumed the name of Churchill.

MARLINE-SPIKE, an iron pin tapering to a point, and principally used to separate the strands of a rope in order to introduce the ends of some other through the intervals in the act of knotting or splicing; it is also used as a lever in marling, fixing seizings, &c.

MARLOW, GREAT. See GREAT MARLOW.

MARLOWE, CHRISTOPHER, an eminent English poet and dramatist of the Elizabethan age, was born at Canterbury, February, 1564, and educated at Cambridge, whence he proceeded M.A. in 1587. He afterwards settled in London, and became an actor as well as a writer for the stage. Besides six tragedies of his own composition, the best known of which are Tamburlaine the Great, Edward II., Dr. Faustus, and the Jew of Malta, he left a translation of the Rape of Helen, by Coluthus; some of Ovid's Elegies; the first book of Lucan's Pharsalia; and the Hero and Leander of Musæus, completed by George Chapman. He appears to have led a reckless dissipated life, and died 16th June, 1593, from a wound received from the hand of a servant man whom he had attacked on suspicion of being rivalled by him in the favours of a mistress. Marlowe was the greatest genius of all the dramatic writers before Shakspere, between

whom and the moralities (see MORALITY) he may be considered the connecting link; and to him we owe the first regular form of the English drama cleared of rhymes. A collective edition of his works by the Rev. Alexander Dyce, D.D., in three volumes, small 8vo, was published in 1850.

MARLY, or MARLY-LE-ROI, a village of France, department of Seine-et-Oise, on the left bank of the Seine, 10 miles west of Paris, near St. Germain and Versailles, on the edge of the forest of the same name. It still contains some fine country seats; but the royal castle built by Louis XIV. and the beautiful gardens attached to it no longer exist, having been destroyed during the revolution. It is now remarkable only for its water-works for supplying Versailles with water. The celebrated machine which conducted the water over the Seine having fallen to decay its place is supplied by a forcing-pump, which raises the water 500 feet, and an aqueduct of thirty-six arches. Pop. 1250.

MARMALADE, from the Portuguese *marmelada*, and that from *marmelo*, meaning 'quince,' is a jellied or gelatinous preparation made from quinces, peaches, apricots, oranges, &c., and portions of their rinds, with a mixture of sugar and spice. The name is now almost exclusively restricted to preparations of oranges and lemons. It is made like the ordinary jams, poured out warm into pots or jars, and sold in commerce as a confection. The most common kind of marmalade in Britain is that made from bitter or Seville oranges. The manufacture of this kind of marmalade is largely carried on in Dundee.

MARMANDE, a town of France, in the department of Lot-et-Garonne, 50 miles above Bordeaux, with which it carries on an important general trade. It crowns a plateau, which rises rapidly from the banks of the Garonne, here crossed by a handsome bridge of a single arch, and is a clean and pleasing town, with somewhat of a venerable aspect, many of its houses being timber-framed. It has several tolerable squares, a town-house, courthouse, college, and hospital; several handsome fountains; manufactures of hats, woollen stuffs, brandy, leather, and cordage; a commodious and much-frequented harbour, and a trade in grain, flour, wine, brandy, dried prunes, tobacco, hemp, &c. Pop. (1881), 9857.

MARMONT, AUGUSTE FRÉDÉRIC LOUIS VIESSE DE, Duke of Ragusa and Marshal of France, born at Châtillon-sur-Seine on 20th July, 1774, entered the army as a lieutenant of infantry in his fifteenth year. In 1792 he changed to the artillery, and at Toulon became acquainted with Bonaparte, who chose him for his aide-de-camp. He was made a captain in 1794. In the campaign of 1795 he fought on the Rhine, and next year distinguished himself in Italy under Bonaparte, whom he afterwards accompanied to Egypt. In 1800 he led the artillery reserve over Mount St. Bernard, and after the battle of Marengo attained the rank of general of division. In 1805 he went with Napoleon to Germany, where he had part in the taking of Ulm. Sent afterwards to Dalmatia he successfully defended the Ragusan territory against the Russians and Montenegrins, and was rewarded with the title of Duke of Ragusa. At the opening of the campaign against Austria in 1809 he united his troops with those of the Italian army, and was present at the battle of Wagram. He was employed to pursue the enemy, and after the truce of Znaim was made field-marshal. He afterwards governed the Illyrian Provinces till 1811, when he succeeded Masséna as commander in Portugal. Assuming the offensive he formed a junction with Soult, raised the siege of Badajoz, and kept Wellington for some time in check, but was ultimately unable to maintain his ground, and by a false manœuvre lost the battle of Salamanca. In the campaign of 1813 he held the command of an army corps in Germany, and fought at Lützen, Bautzen, and Dresden. He was wounded at the battle of Leipzig, and after the retreat was employed along with Victor and Macdonald to defend the Rhine. The superiority of the allies drove him back within the French frontiers, but he still made a vigorous defence at Brienne, Champ-Aubert, and Montmirail, and gained some advantages over Blücher at Meaux. He was at last obliged to take up a position with his corps under the walls of Paris. Here he fought a battle which lasted from the morning of 30th March till four P.M. On the following day he retired with the remains of his troops by the road of Essonne, and as opposition seemed now fruitless concluded an armistice with Barclay de Tolly. This proceeding, which was bitterly censured by the Bonapartists, was one main cause of Napoleon's immediate abdication, and brought Marmont into high favour with the Bourbons. The light in which Bonaparte regarded him was strongly manifested on his return from Elba by specially excluding him from the benefit of the general amnesty. He accordingly crossed the French frontier, and during the Hundred Days resided at Aix-la-Chapelle. Under the second restoration he was made major-general of the guard, and after suppressing the disturbances at Lyons in 1817 devoted himself for a time to agriculture and industrial undertakings. At the outbreak of the revolution in 1830 he was appointed to the command of the first military division on the 26th July, and after an unsuccessful struggle withdrew from Paris on the 29th with 6000 Swiss and some battalions which had remained faithful. He accompanied Charles X. in his exile, and afterwards, taking Vienna for his usual residence, travelled over most of the countries of Europe, the borders of the Caspian and the Levant, &c. The results of his travels were published in 1837–39 in six volumes. He also wrote Esprit des Institutions militaires and his own memoirs. He died at Venice on the 2d of March, 1852. He was the last surviving marshal of the first French Empire.

MARMONTEL, JEAN FRANÇOIS, a distinguished French writer, was born 11th July, 1723, at Bort, in Limousin. He was the eldest son of a large family, the offspring of parents in an humble situation of life; but his mother, a woman of sense and attainments much superior to her rank, favoured his ardour for mental cultivation; and by her influence he was sent to the Jesuits' College of Mauriac. At the age of fifteen his father placed him with a merchant at Clermont; but having expressed his dislike of this occupation he was enabled to obtain admission into the College of Clermont, where he gradually acquired pupils. He subsequently engaged as a teacher of philosophy in a seminary of Bernardines at Toulouse, and became a distinguished candidate for the prizes at the Floral games, which acquired him the notice of Voltaire, who recommended him to try his fortune at Paris. He accordingly arrived there in 1745, and after experiencing some vicissitudes brought out a tragedy, Denys le Tyran, in 1748, which at once raised him into competence and celebrity; and having been recommended to the king's mistress, Madame Pompadour, he was appointed historiographer of the royal buildings, under her brother the Marquis de Marigny, with a pension of 1500 livres. Having distinguished himself by writing some of his well-known tales to assist his friend Boissy, then intrusted with the Mercure de France, on the death of the latter it was given to him, and resigning his post of historiographer he took up his abode with Madame Geoffrin. The right of publishing the Mercure gained him 40,000 livres. He subsequently lost the Mercure by

merely repeating in company a joke upon the Duke d'Aumont, and was committed to the Bastille because he would not give up the real author. In 1763, after much opposition, he succeeded Marivaux as a member of the French Academy. His next literary production was Bélisaire, which, in consequence of its liberal sentiments in favour of toleration, was censured by the Sorbonne, and widely read in every country in Europe. In order to benefit Grétry he worked up several little stories into comic operas, which were all acted with great success. On the death of Duclos he was appointed historiographer of France. In 1783, on the death of D'Alembert, he was elected secretary to the French Academy. On the breaking out of the revolution he retired to a cottage in Normandy, where he passed his time in the education of his children and the composition of a series of tales of a more serious cast than his former ones, together with his amusing Memoirs of his own Life. In 1796 he became member of the National Institute, and in April, 1797, he was chosen member of the council of elders; but his election being subsequently declared null he again retired to his cottage, where he died of apoplexy, 31st December, 1799, in the seventy-seventh year of his age. Marmontel holds a high place among modern French authors. The works by which he is chiefly known are his Contes Moraux (1765), Bélisaire (1767), les Incas (1777), Eléments de littérature (1787).

MARMORA, or MARMARA, SEA OF (anciently *Propontis*), an inland sea, lying between European and Asiatic Turkey, or between south-eastern Europe and the most westerly part of Asia, communicating with the Mediterranean by the narrow strait called the Dardanelles, and with the Black Sea by the Bosporus. Length from Gallipoli to the head of the Gulf of Izmid, 177 miles; greatest breadth, which is near the centre, or about lon. 28° 10′ E., rather more than 50 miles. With exception of the gulfs of Izmid and Moudania, both on the Asiatic side, it has no very marked indentations. It has several islands, of which the largest is Marmora, famous for its quarries of marble and alabaster, situated towards its western end, whence the sea derives its name; three or four other islands lie in its vicinity, and at the eastern end, on the Asiatic coast, and not far from Constantinople, is a group called the Princes Islands. A current sets from the Black Sea into the Sea of Marmora, which in turn runs into the Archipelago. The tides are hardly perceptible, and the navigation is easy.

MARMOSET, a genus of Quadrumana or monkeys, forming the typical genus of the family *Hapalidæ*. These forms belong to the *Platyrhina* or New World monkeys, which are distinguished by the wide separation of the nostrils, by the very general possession of a prehensile tail, and by the absence of natal callosities and cheek-pouches. The marmosets are all of small size, and are exclusively confined to South America, being specially found in the Brazilian forests. They possess long, non-prehensile tails, and have a thick woolly fur. They bear a close resemblance to squirrels in general appearance, and appear to be habitually quadrupedal in their movements. The ears are of large size. The fore limbs are short as compared with the hinder extremities, and the thumbs are not opposable, and like the other fingers are provided with sharp claw-like nails. The 'hands' in these monkeys are therefore hardly to be so termed, since their functions as prehensile organs are quite in abeyance. The great toes possess flattened nails, are of small size, and can be opposed to the other digits of the feet. The marmosets are notable among monkeys for the relatively large size of the brain-case. The cerebral hemispheres or halves of the true brain are large in comparison with those of more anthropoid apes and with the relative size of the marmosets themselves; and in particular the hinder lobes of the cerebrum are described as projecting greatly beyond the cerbellum or lesser brain, and as entirely covering the latter when looked at from above. The teeth number thirty-two, as in man and the Catarhine or Old World monkeys; but there is one *molar* less than in man, and an additional premolar in each side of upper and lower jaws. The dental formula (see MAMMALIA) therefore runs thus —

$$I\ \frac{2-2}{2-2} : C\ \frac{1-1}{1-1} : P.M\ \frac{3-3}{3-3} : M\ \frac{2-2}{2-2} = 32$$

As already observed, and as is the case in the New World monkeys, there are no cheek-pouches or hard patches—'callosities'—on the nates. The molar or grinding-teeth in the marmosets are tuberculate, that is, are provided with little tubercles or cusps—a structure adapted for crushing the insects upon which those monkeys partly subsist. They are also fruit-eaters, and appear to feed occasionally upon the smaller birds and their eggs. The marmoset genus includes a great number of distinct species, the most familiar and common species being the common marmoset (*Hapale penicillata*). They are readily susceptible of being tamed, and may be completely domesticated as household pets. (Pl. VI.–VII. fig. 15.)

MARMOT (*Arctomys*), a genus of rodent Mammalia of small size, included in the family of the Sciuridæ or squirrels. The dentition agrees essentially with that typically found in the Rodentia, and from the peculiarities of which the order derives its chief characteristics. There are four toes and a rudimentary thumb on the fore feet, and five developed toes on the hind members. The marmots differ greatly in habits from the true squirrels, being terrestrial in habits, and living in burrows which they excavate in the ground. But certain nearly allied forms appear to form connecting links between the marmots and squirrels. Such are the European earth or ground squirrels (*Tamias*), which are also found in Siberia and North America, and which are almost wholly terrestrial in habits and live in burrows. The marmots inhabit Europe, Northern Asia, and North America, extending in the latter continent as far south as Mexico. They do not possess cheek-pouches like the nearly allied Tamias and Spermophiles. The burrows are excavated generally, though not invariably, in mountainous situations, and consist of a series of galleries in which whole communities are resident. The winter is passed in a state of hybernation, and the entrances to the burrows are said to be closed by bundles of dry grass which the marmots bring in with them at the close of the autumn season. Many species and varieties of marmots are known. The Alpine or European Marmot (*Arctomys Alpinus*) is found in plenty on the Alpine range, and averages a rabbit in size, being of a lightish-brown colour. It lives immediately below the snow-line, and subsists upon vegetables, insects, and roots. They come forth from their burrows during the month of April, and are said to be readily tamed. The Bobac, another European species (*A. bobac*), inhabits Russia and Poland. The prairie dog of North America (*Cynomys Ludovicianus*), or wistonwish, is the most familiar American species, and is found in vast numbers on the prairie-lands of that continent. The entrance to the burrows of these latter forms is marked by a conical hillock composed of the earth which has been thrown out in the process of excavation; and immense numbers congregate together to form these societies, or 'villages,' as they are termed. The cry of the prairie dog resembles a shrill bark, whence the popular name of these animals has been derived. A species of owl (*Athene cunicularia*) is alleged to

be co-tenant of the burrows with the prairie dogs; and the rattlesnake has also been credited with forming part of a curious social community. The owls form a species of burrowing owl, and their presence in the prairie dog community is thus readily explicable from a consideration of their habits, and from their taking possession of an empty burrow in which to reside. The presence of rattlesnakes, although described by some travellers as an invariable occurrence, does not appear to be anything more than a mere occasional and accidental circumstance. Other species, found in America, and which may be regarded as belonging to either the marmot or Spermophile genus, are the Quebec Marmot (*A. Empetra*) and the woodchuck of the middle American states (*A. monax*). The former appears to be a solitary form; whilst the latter, known locally as the 'ground hog,' is a social species, and chiefly subsists on vegetable matter. The burrows are excavated in the sides of hills; and the females are said to produce six young at a birth. Many other subgenera and varieties of marmots have been described, but some of these latter are of doubtful nature. (Pl. CLXXII.–CLXXIII. fig. 3.)

MARNE (Latin, *Matrŏna*), a river of France, the largest tributary of the Seine on the right, rises in a ramification of the Vosges, about 3 miles south of Langres, in the department of Haute-Marne, which department it traverses S.S.E. to N.N.W., passing near Chaumont, and close to Joinville and St. Dizier; proceeding thence, first in a north-western, and then in a western direction, it traverses Marne, part of Aisne and Seine-et-Marne, and in department Seine enters the Seine, about 3 miles above Paris. In its course of about 280 miles, of which 210 miles, or from St. Dizier, are navigable, it passes Châlons, Épernay, Château-Thierry, and Meaux. In 1851 it was connected with the Rhine by a canal.

MARNE, a department of France, bounded north by Ardennes, north-west by Aisne, south-west by Seine-et-Marne, south by Aube, south-east by Haute-Marne, and east by Meuse; is 67 miles long by 60 miles broad, and has an area of 3158 square miles. The surface forms a kind of plateau, which by a long and gradual ascent attains in some parts the height of 1200 feet. The soil, which forms only a thin covering upon chalk, is by no means fertile. About two-thirds of it, however, is arable, and the crops, consisting chiefly of rye and oats, more than supply the consumption. The vine is cultivated; but though the champagnes of Rheims and Épernay are famous the general produce of the vineyards is indifferent. The trade is chiefly in corn, flour, wine, brandy, combed wool, woollen, and other tissues, wood and charcoal, colonial produce, &c. For administrative purposes Marne is divided into five arrondissements — Châlons-sur-Marne, the capital; Épernay, Rheims, St. Menehould, Vitry-le-François—subdivided into thirty-two cantons and 664 communes. Pop. (1881), 421,900.

MARNE, HAUTE, a department of France, bounded on the north by Meuse, north-west by Marne, west by Aube, south-west by Côte d'Or, south-east by Haute-Saône, and east by Vosges; is 74 miles long by 45 miles broad, and has an area of 2401 square miles. Ramifications of the Vosges, partly in continuous chains and partly in isolated groups, make the greater part of the surface mountainous. The elevated plateau of Langres in the department forms part of the great European watershed, sending its waters both northwards to the Atlantic and the German oceans, and south to the Mediterranean. The principal rivers are the Marne, with its tributaries, and the Meuse. The ordinary agricultural crops equal the consumption, and the wine, though not of first-rate quality, is partially exported. The forests, consisting chiefly of excellent hardwood, are extensive, and furnish fuel for the several blast-furnaces employed in smelting the iron-stone of the department. The coal-measures are partially developed, but the prevailing rock is Jura limestone. For administrative purposes Haute-Marne is divided into three arrondissements—Chaumont, the capital, Langres, and Vassy, subdivided into twenty-eight cantons and 550 communes. Pop. (1881), 254,876.

MAROCCO, or MOROCCO, EMPIRE OF (anciently *Mauritania*), a state occupying the north-west extremity of Africa, and known to its inhabitants only by its Arabic name, *Moghreb-el-aksa*, the Extreme West. It is bounded on the west by the Atlantic Ocean, north by the Mediterranean Sea, north-east by Algeria, and east and south by the desert; lat 28° to 36° N., and lon. 0° 38′ to 11° 38′ W.; area, about 222,560 square miles. The rulers of Marocco exercised sovereignty at one time over Tegorarin, Twat or Touat Arawân or Arouan, and several other oases in the heart of the desert; they even carried their victorious arms across the desert to Timbuctoo and Kaghó. At the present day, however, they have little or no real power south of Atlas. The country is traversed diagonally north-east to south-west throughout its whole extent by the mountain-chain of Atlas. The former capital is also named Marocco. The Empire of Marocco is not divided in the manner of European states. The division best known in it is that derived from the occupying tribes; another is that of the Ammals or districts, now thirty in number, but fluctuating and very unequal, sometimes confined to a single town, sometimes embracing an extensive territory, administered each by a kaid, whose chief duty it is to collect the imposts. Physically considered, it falls naturally into four regions: 1. The great range of Atlas, from south-west to north-east, composed of two or more parallel chains. 2. Er-Rif, or the northern maritime district, comprising the chains of mountains which rise at no great distance from the Mediterranean Sea. 3. The wide belt of fertile plain, intermixed with gentle hill and valley, which lies between the two preceding regions. 4. The plains and valleys south-east of Atlas. These last all terminate in or adjoin the desert.

Natural Features.—The most remarkable natural feature of this country is the great chain of mountains extending through it from north-east to south-west. This chain—the great Atlas—composed indeed of several parallel chains, contains the most elevated points known in North Africa. Miltsin, a peak distant about 30 miles S.S.E. from the city of Marocco, has an absolute height of 11,400 feet. Adjoining the central chain are several table-lands of great extent, consisting of irregular plains; and at a little distance from it north extends the maritime chain now called Er-Rif, and formerly the Atlas Minor. Its general height is from 2500 feet to 3500 feet. The height of these mountains, and the general uniformity of their slope on both sides, procure for Marocco the distinction of having the largest rivers of all North Africa. Of these, the rivers flowing from the north side of the Atlas have the shorter course, but are well supplied with water; those running south extend much farther, but are dry in summer. The Muluïa, rising in a principal knot of the Atlas, nearly in latitude 32° 30′ north, flows north-east to the Mediterranean with a course of 350 miles. In all the revolutions which the political divisions of the country have undergone it has been constantly selected as a boundary; and now its valley forms, in the maritime district, the boundary between Marocco and Algeria as settled by treaty in 1845. Of the rivers which run into the desert, the

most easterly, the Guir, seems to have a course S.S.E., occasionally traceable for 300 or 400 miles. The Ziz, which, with its numerous affluents, waters a very fertile and populous country, is wholly spent before it attains half that length. The Daraa, which rises in the central and most elevated portion of the range of Atlas (latitude 31° to 32° north), first runs south for nearly 200 miles, forms Lake Ed-Debaia, and then, turning west, enters the ocean in latitude 28° 18′ north, after a course of 700 miles. The lower portion of its bed, however, is periodically quite dry. Lake Ed-Debaia, formed by the floods of the Daraa, is reported to be very large; but it disappears annually, and gives way to richly cultivated fields. The fresh-water lake of Jebel el Akhdar (Green Mount) lies about 30 miles north of Marocco. The coast offers few good harbours; of these Tangier and Mogadore, or Sweira, are the best; the rest are but open roadsteads at the mouths of rivers. The climate west of Atlas is much more temperate than might be expected under such low latitudes. This is due to the circumstance that a lofty chain of mountains, covered in some parts with perpetual snow, intercepts the hot winds from the deserts of the interior, so that the equable and refreshing sea-breezes prevail throughout the year. Hence the extremes of temperature lie within moderate limits; the thermometer rarely falling below 40° Fahr. in the winter, while it does not rise above 95° in summer. In the region east of the mountains intense cold is felt in winter; while in summer the heat of the plains is insufferable.

Natural Products—Agriculture, &c.—The extent of the mineral wealth possessed by Marocco is not known with any accuracy. Copper, iron, and lead are obtained in larger or smaller quantities. The flora of Marocco includes the esculent oak and cork oak; in the higher regions of the Atlas the cedar and Aleppo pine, with many varieties of oxycedrus and juniper yielding fragrant gums; also the date-palm and the dwarf-palm east and south of the Atlas; and near the coast the *Elæodendron argan*, which yields an excellent oil. The agriculture of Marocco is in the lowest possible condition, and the annual production is calculated barely to supply the wants of the country; though with proper cultivation and under an enlightened government Marocco might be one of the most productive countries in the world. The cereal crops are wheat, barley, and maize; but durrah or millet (*Sorghum vulgare*) constitutes the chief support of the population, though beans, the esculent arum, and even canary seed are much eaten by the poorer classes. The vine is cultivated only near towns for the sake of the fresh grapes and for the raisins. All the fruits of the south of Europe are cultivated to some extent. Large numbers of the inhabitants lead a pastoral life, subsisting wholly on the produce of their herds and flocks, or else on game and the wild fruits of the forest. Among the wild animals are lions, panthers, ounces, wild boars, gazelles, and several species of large antelope, especially the bubalus. The locust makes its appearance in May, when it lays its eggs. The young brood come forth a month later in countless multitudes, and in another month they take wing, consuming all vegetation in their progress, and spreading desolation over the fields. They are gathered and eaten in large quantities. The ostrich is found on the south frontiers of Marocco. The wealth of the Arab tribes who are scattered over Marocco consists chiefly in their herds and flocks. The spirited small horses, for which the country was famous in ancient times, are still numerous, particularly in the southern provinces. Horned cattle are numerous, particularly in the north districts. The bulls are generally tractable, and are employed in the labours of the field—bullocks being little known. The sheep are supposed to number at least 45,000,000; while the goats are estimated at 10,000,000 or 12,000,000, and furnish a principal article of export—the well-known Marocco leather.

Manufactures and Commerce.—In general, among the rural population, each family supplies all its own wants. In the towns, however, some manufactures have sprung up. Fez makes and exports great quantities of the cloth caps which bear the name of that city. The tanners of Mequenez have a great reputation; and those of Marocco can render the lion's or panther's skin as white as snow and as soft as silk. This is done by means of two plants unknown to European tanners. Of the fine Marocco leather Fez furnishes the red, Tafilelt the green, and the city of Marocco the yellow. The Marocco carpets, so much esteemed in Europe, are made chiefly in the province of Ducalla. The commerce of Marocco may be classed under the heads of commerce with the East, carried on by means of the caravans to Mecca, which have at once a mercantile and a religious character; with Soudan or Negroland, across the Great Desert; and lastly, the maritime trade with European states. From the East are brought silks, perfumes, spices, cotton, &c., for which are exchanged cochineal, indigo, skins, fine leather, woollen cloths, and ostrich feathers. From the Soudan are obtained ivory, gold-dust, ostrich feathers, asafœtida, gums, Guinea pepper, indigo, and slaves. Of the whole of the commerce with Christian states five-sixths in amount are carried on with Great Britain. Five cities, namely, Fez, Marocco, Miquenez, Rabat, and Tetewan or Tetuan, have mints, and coin gold, silver, and copper.

People, Government, &c.—An important element of weakness in the social and political constitution of Marocco is to be found in the division of its population into several distinct races, which, so far from uniting, repel one another. The Berbers are the oldest inhabitants of the country, and they devote themselves to agriculture rather than to pastoral pursuits. The Arabs form the bulk of the rural population in the plains; some of them are cultivators, and some are Bedowin. In the towns along the coast are found the Moors, a people now physically distinct, but whose origin as a distinct race cannot be satisfactorily explained. Their chief physical characteristic is their corpulence, and they are more indolent and much less social than the Arabs. A considerable number of Jews is to be found in all the commercial towns of Marocco, where, in spite of the oppressions to which they are subjected, they often accumulate wealth, being the sole dealers in bullion and holders of capital. To these various ingredients of a checkered population must be added the negroes and their posterity of every shade, who are particularly numerous in the southern provinces. The civilization of Marocco has sunk to a low condition. The education given at the schools in the chief towns, and completed at the University of Fez, does not go beyond the theology of the Koran. The public libraries, once famous, are now dispersed; true science is unknown, and whatever monuments of art are to be found in the kingdom point to the time when literature and art flourished under the Arabian dynasties in Spain. Music is the only art for which the Moors are said to manifest a decided taste, but they have not as yet arrived at any proficiency in it.

The sovereign or Sultan of Marocco, styled by Europeans emperor, bears the title of Emir el Mumenin, or Lord of the True Believers. He is ordinarily called by his subjects simply *Sidi-na*—our Lord. He is absolute in the strictest sense; the lives and properties of his subjects are at his disposal; from him alone proceed the laws, which he makes and unmakes at his pleasure. The imperial revenues are

derived from arbitrary imposts on property, from duties on imports and exports, from monopolies, and from fines or confiscations. The military force maintained by the sultan does not ordinarily exceed 16,000, of whom half are blacks, and of the remainder a large portion are Bedowin from the southern desert. The marine force is insignificant.

History.—In the Mauri of ancient writers it is easy to recognize the Moors of modern times. These people were supposed to have come from Asia, and particularly from Palestine, but their origin is doubtful. The Berbers are believed to be the representatives of the race that inhabited the country in the earliest historical times. The Vandals, at the end of the fifth and beginning of the sixth century, introduced the piratical habits which afterwards became so characteristic of the coasts of Barbary and Marocco. In the latter part of the seventh century the Arabs spread over North Africa, and having taken possession of Mauritania, penetrated to the borders of the desert. About this time the Jews were expelled from Spain by decree of the Council of Toledo (A.D. 694), and sought refuge in great numbers on the shores of Africa. Near the close of the eighth century a Sherif or descendant of Mohammed named Edris obtained such an ascendency over the Berber tribes that they made him their sovereign, with the title of Imâm. His son and successor founded in 807 the city of Fez. In 1035 the warlike sect of the Morabites rose into existence on the borders of the desert. In 1055 their chief was proclaimed sovereign of Moghreb-el-aksa. His grandson and successor crossed the mountains, and in 1072 laid the foundations of the city of Marocco, which thus arose with the remarkable dynasty of the Morabites. The expulsion of the Moors and Jews from Spain (A.D. 1480–1501) added 800,000 souls, it is said, to the population of Moghreb-el-aksa. In the middle of the sixteenth century a new dynasty commenced with the descendants of the Sherif Hosein. The fifth of this family, commonly called Hamed Sherif el-Mansúr (1579–1603), made himself master of the whole of Moghreb-el-aksa, and pushed his conquests through the desert as far as Timbuctoo and Kaghó. His reign is regarded as the golden age in the history of Marocco. The ninth and last Moroccan dynasty is that founded in 1648, by Mulai Sherif el Fileli, or King of Tafilelt. In 1814 the slavery of Christians was abolished, and piracy was prohibited in 1817. Several complications arose with France, caused by the plundering of French vessels by pirates, but in each instance the emperor gave compensation. In 1860 a war broke out with Spain, owing to attacks made by some of the wild tribes upon the Spanish territory, and resulted in a cession of land and an indemnity of £4,000,000 to Spain.

For an estimate of the population of Marocco there are no certain data. One of the most recent calculations estimates it at from 6,000,000 to 6,500,000. The majority of the inhabitants are Berbers, and next in number to these are the Arabs, pure and mixed, the Jews and Negroes. About 5000 Europeans belong to the ports. Only about 800,000 of the population dwell south of the Atlas range.

MAROCCO (Arabic, *Marakasch*), the former capital of the empire of the same name, on the north side of an extensive and fertile plain, 1500 feet above sea-level. It is nearly 6 miles in circuit, and is surrounded by a wall of tappia work (lime beaten in a case or frame with earth) 30 feet high, with foundations of masonry, and square towers every 50 paces. In the walls there are nine gates. Both walls and towers are in a ruinous condition. The streets are unpaved, dirty, narrow, and irregular. The houses are generally of one story, flat-roofed, the side towards the street plain and white-washed; here and there a narrow unglazed opening for a window, and the apartments fronting into a court. There are several open areas throughout the city used as market-places; besides which there is a covered bazaar where a great variety of articles are always on sale. There are many mosques, some of which are more remarkable for their size than their architectural merits. On the south of the city stands the palace, comprising a space of about 1500 yards long by 600 yards wide, and near it is the Jews' quarter (El Millah), a walled inclosure of about 1¼ mile in circuit, one half of it nearly in ruins, thronged to suffocation, and excessively filthy. There are several tanning and leather-dyeing establishments, one of which is said to employ 1500 persons. The leather is chiefly of the yellow and red dyes, and is justly held in the highest estimation. There are the ruins of extensive aqueducts in the vicinity of the town, some of them 20 miles in length. There are also several large cemeteries outside the walls, one of which is upwards of 100 acres in extent. Marocco has long been hastening to decay, and is now nearly half in ruins, the result of war, plague, and wretched government. Pop. estimated at 40,000 to 50,000.

MARONITES, a sect of eastern Christians, whose origin was a consequence of the Monothelite controversy. In the seventh century the opinion that Christ, though he united in himself the divine and human nature, had but one will (Monothelitism), arose among the eastern nations, and was supported by several emperors, particularly Heraclius. But when their last patron, the Emperor Philippicus Bardanes, was deposed and exiled in 713, the Monothelites were condemned and banished by his successor, Anastasius. The remnant of this party survived in the *Maronites*, so named from their founder Maron—a society of monks in Syria, about Mount Lebanon, which is mentioned as early as the sixth century. Another monk, John Maro, or Marum, also preached Monothelitism there in the seventh century. Regarded as rebels by the Melchites, or Christians who adhered to the opinions of the emperor, they became, in the country of Lebanon, which is now called Kesrawan, a warlike mountain people, who defended their political as well as their religious independence boldly against the Mohammedans, and who even now, under the Turkish government, resist the payment of a tribute, like the Druses. The political constitution of the Maronites is that of a military commonwealth. Governed by their ancient customary rights, defended from external attacks, they support themselves among the mountains by husbandry and the produce of their vineyards and mulberry-trees. The revenues of all their orders of ecclesiastics are very small, but a common spirit unites them, and in simplicity of manners, temperance, and hospitality, they resemble the ancient Arabians. Revenge for murder is permitted among them, and as a sign of nobility they wear the green turban. Their church constitution resembles very much that of the old Greek Church. Since the twelfth century they have several times submitted to the pope, and joined the Roman Catholic Church, without giving up their own peculiarities. At last Clement XII. induced them to accept the decrees of the Council of Trent at a synod held in 1736 at their convent of Marhanna. After this synod their priests still retained the right to marry, after the manner of the Greek Church; and they continued to administer the sacrament under both forms. The use of the Arabic language was preserved in the church service. Mass only was read in the ancient Syriac. Their head is called the *Patriarch of Antioch*, although his residence is in the monastery of Kanobin, upon Mount Lebanon; and he gives an account every ten years to the pope of

the condition of the Maronite Church. Under him are the bishops and other clergymen, who form seven degrees of rank. In Kesrawan are over 200 Maronite convents and nunneries, containing in all from 20,000 to 25,000 members who profess the rule of St. Anthony, and devote themselves to agriculture and gardening. Since 1584 there has been a Maronite college established at Rome for the education of clergymen; yet neither this establishment, nor the mission of Papal nuncios, has effected an entire incorporation of this sect with the Romish Church; and those in Kesrawan, as well as the large numbers in Aleppo, Damascus, Tripoli, and in Cyprus, still retain their ancient habits, and some even their ancient liturgy. At present the Maronites are supposed to number about 150,000, and these are distributed into 150 parishes. In consequence of the sanguinary conflicts between the Maronites and Druses, June 1860, both communities are now subject to one governor appointed by the Porte, with the title of governor of the Lebanon. See DRUSES.

MAROONS, the name given to runaway negroes in Jamaica and in some parts of South America. Some suppose the appellation to be derived from Maroni, a river separating Dutch and French Guiana, where large numbers of these fugitives resided; while others derive it from a word used in Spanish America, and signifying *hog-hunters*. In many cases, by taking to the forests and mountains, they rendered themselves formidable to the colonies, and sustained a long and brave resistance against the whites. When Jamaica was conquered by the English in 1655 about 1500 slaves retreated to the mountains, and were called *Maroons*. They continued to harass the island till 1795, when they were reduced by the aid of blood-hounds. Some of them were removed to Nova Scotia, and afterwards to Sierra Leone. Those that were left fraternized with their emancipated brethren (1834–35). See Dallas' History of the Maroons.

MAROS-VASARHELY, a town of Transylvania, on the Maros, in a beautiful and fertile district, 54 miles N.N.E. of Hermannstadt. It occupies several hills, is fortified, and generally well built; contains five churches, a gymnasium, seminary, college, a library of 60,000 volumes, and a good cabinet of minerals. Not far from the town is a strong castle, in which a garrison is stationed. The district around is fertile, and produces much wine and fruit, but more especially tobacco, which is in request in all the markets of Hungary. Pop. (1880), 12,813.

MAROT, CLEMENT, a French epigrammatist and writer of light lyrical pieces, from whom the French date the beginning of their poetry, born at Cahors, 1495, went to Paris as page of Margaret of France, duchess of Alençon, whose brother Francis I. he afterwards accompanied to the Netherlands. His amour with the beautiful Diana of Poitiers, the king's mistress, is well known. In 1525, having followed the king to Italy, he was wounded and made prisoner in the battle of Pavia. After his return to Paris he was suspected of being favourable to Calvinism, and was thrown into prison. His time during his confinement was spent in preparing a modernized edition of the Romance of the Rose, and the king finally set him at liberty. His connection with Margaret, now Queen of Navarre, with whom he had quarrelled, was renewed, but could not protect him from new difficulties on account of his religious sentiments, and he fled to Italy, and thence to Geneva (1535), where Calvin succeeded in making him a proselyte to the new doctrines. He soon recanted his profession of faith, returned to Paris, and not long after again fled to Turin, where he died in poverty in 1544. Marot had a graceful and fertile fancy, a lively wit, with a certain levity of character. All his poems, even his translation of the Psalms, made in conjunction with Beza, and for a long time used in the Protestant churches in France, are in an epigrammatic manner. Nature and *naïveté* are the characteristics of his style, called by the French *style Marotique*. His works have been repeatedly printed with those of his father John and his son Michel. They appeared by themselves (three vols. 8vo, Paris, 1824), with his life and a glossary.

MARQUE, LETTER OF. See LETTER OF MARQUE.

MARQUESAS, or MENDAÑA ISLANDS (French, *Marquises*), an island group in the South Pacific Ocean, lat. 8° to 11° S.; lon. 138° 30′ to 143° W., composed of twelve islands and islets divided into two groups, the northern and southern. Their coasts are generally inaccessible, rising from the water like walls; but in Nukahiva there are some excellent natural harbours. The islands are generally high, some of their mountains reaching an elevation of about 5000 feet; they are extremely broken and craggy, with a sandy belt of land between them and the sea; but the intervening valleys are singularly fertile and picturesque, being copiously watered by streams which form numerous cascades. Their principal food productions are pulse, yams, cocoa-nuts, sugar-cane, cotton, and bamboos; hogs also are numerous. The men are well-formed, active, and powerful—all tattooed, but not with much taste. The women have regular features, good complexions, fine teeth, and neat hands, and are altogether the finest of the sex to be met with in Polynesia. The people of these islands were formerly cannibals, but though this practice has been discontinued cruelty and ferocity are prevailing characteristics, and the efforts of the missionaries have met with but little success. The Marquesas were discovered in 1595 by Alonza Mendaña de Neyva. They were subsequently visited and described by Cook and the Forsters in 1774, when Hood's Island was added to the group. In 1791 three more were discovered by an American captain called Ingraham, and were named Washington Islands. In 1842 they acknowledged the sovereignty of France, and by convention of 19th June, 1847, they were placed under the protectorate of that country. The population of the whole group in 1876 was 5754.

MARQUETRY (French, *marqueterie*), inlaid cabinet-work in which thin slices of different coloured wood, sometimes of ivory, pearl, shell, or metal, are inlaid on a ground usually of oak or fir, well seasoned to prevent warping. The marquetry of Italy possesses much artistic merit, while that of Würtemberg is distinguished by its cheapness. At one time figures and landscapes were represented by means of marquetry, but it is now chiefly employed in the ornamentation of floors, the various pieces of wood, which seldom exceed three or four species, being disposed in regular geometrical figures.

MARQUIS, MARQUESS (in Middle Latin *marchio;* Italian, *marchese;* French, *marquis;* German, *markgraf*), a title of honour next in dignity to that of duke, first given to those who commanded the marches or frontiers of countries. Marquises were not known in England till King Richard II., in the year 1387, created his great favourite Robert Vere, the earl of Oxford, Marquis of Dublin. In 1397 the same king raised John de Beaufort, earl of Somerset, to the rank of marquis, a dignity which he afterwards refused to bear from its being an innovation. The title fell into disuse until the reign of Edward VI., who created the Marquisate of Winchester in 1551. The title given a marquis in the style of the heralds is *most noble and potent prince*.

MARRIAGE, a solemn contract between a man and woman, by which they are united for life, and

assume the legal relation of husband and wife. It rests on the fundamental principles of our being, and gives rise to the primary element of all order and civilization—the domestic connections. It has existed in all ages, and probably in all nations, though with very different degrees of strictness. It is not the invention of legislators, but arose from the instincts and necessities of society, and its continuance has been provided for by the dictates of experience. Different localities have different forms of the institution, the most broadly marked of which are connected with the right to have only one wife—*monogamy;* or a plurality of wives—*polygamy.* The latter, in addition to its implying permission to have more wives than one—*polygyny,* is held to include the permission for a woman to have several husbands—*polyandry,* a state of society which, however repugnant to our notions, is known to have existed in ancient times, and still exists in various localities, as in Tibet. Among the most civilized communities monogamy is the prevailing practice, possessing among other advantages a simplicity in defining the obligations of parents to their progeny not easily attainable where polygamy is allowed. There are three modes of acquiring property—capture, gift, or sale; and as in the earliest times a man's daughters were regarded as his property, he parted with them only on recognized commercial principles. Hence in ancient law the marriage relation is founded on the contract of sale, and the wife came into the possession of her husband, like other chattels, when delivery had been made after payment of the stipulated price. Therefore the conducting of the bride to her husband's house was an important and generally an imposing ceremony. The parties themselves were seldom consulted in cases of marriage, the arrangements being instituted and completed, and the contract carried out, by the heads of the families. In the progress of civilization, however, the children were allowed greater freedom of action, and effect was given to individual likings by permitting a choice. The common law now treats marriage as a civil contract, and holds it to be valid only where it is entered into by persons able and willing to contract according to established solemnities. It is essential that each of the parties must have exercised free-will, for it is the consent which constitutes the marriage. Though the Church of Rome ranks it among the sacraments, and religious observances are almost everywhere customary on its celebration, the law regards it as nothing more than a civil contract. The modes of constituting marriage in the three kingdoms of England, Scotland, and Ireland vary considerably, and an account of these differences may be both interesting and useful.

To render valid the civil contract constituting marriage in England it is requisite that the free-will of each of the parties should be spontaneously exercised. If either of the parties has not consented, or if consent has been obtained by fraud, error, or duress, the marriage is void though the requisite formalities may have been observed. Nor can marriage be contracted by persons of mental capacity so defective as to disqualify them for giving consent, such as lunatics, idiots, and children. If, however, during a lucid interval, a lunatic has contracted a marriage, it is valid, unless at the time there exists an unrevoked commission of lunacy. In males the age of consent is fourteen, and in females twelve. A child under seven years cannot marry, but the marriage of parties between seven and fourteen or twelve respectively is not necessarily void, but only imperfect. Before it can be annulled the party wishing it must have reached the age of consent, and a judicial dissolution will not be necessary. If both agree to live together after the age of consent has been reached, a new marriage ceremony is not required. A promise to marry given by a person under twenty-one is not binding. Ability to contract is necessary to the parties to a marriage as well as the will. The legal disabilities are: (1) An undissolved prior marriage, and the former husband or wife still living. The second marriage is void, and punishable as a felony. (2) Being within the prohibited degrees of consanguinity or affinity. Lineal consanguinity is ascending, as father, grandfather, &c.; or descending, as son, grandson, &c. Collaterals nearer than the fourth degree are prohibited from marrying by the civil law. Cousins-german, who are of the fourth degree, may marry. Meanwhile, as a wife's sister is of the second degree, marriage with her is prohibited, as with one's own sister. (3) Impotence or inability to consummate the marriage; but the impotence must have existed at the time of the marriage, and be incurable. (4) The fraudulent suppression or alteration of the name of one or both in the publication of the banns; but this does not invalidate a marriage by license. All banns of marriage must be published three Sundays in the parish church or public chapel of the Establishment, in the parish wherein both, or the parish wherein each of the parties dwell. Though the statute directs that the consent of parents or guardians shall be obtained to the marriage of minors, the want of such consent does not invalidate the marriage. When necessary a guardian may be appointed by the Court of Chancery. When the person whose consent is required dissents on the publication of banns, his objection is decided upon by the minister in the vestry-room after the service is over. Where the marriage is to be by license, if the person whose consent is required has an objection he must enter a *caveat* against granting a license, and the master of faculties, after discussion, will settle the question according to his discretionary jurisdiction. The English courts, regarding marriage as indissoluble, did not formerly recognize the divorces of the Scotch and other foreign courts. The passing of the divorce act first rendered marriage dissoluble in England. Marriages formerly had to be solemnized in a church by a person in holy orders, but the marriage act, 6 and 7 William IV. cap. lxxxv., amended by later acts, appointed a superintendent registrar of marriages, who must register marriages, and can grant licenses, either himself or by inferior registrars. Marriages may be celebrated before the superintendent registrar, and the contract may thus be entirely removed from ecclesiastical control. But these acts do not extend to the marriages of the royal family, nor to any marriage taking place out of England. There is no restriction as to time or place of marriage where a special license has been obtained. Theoretically, special licenses are to be granted only to persons of a specified rank, but practically this restriction does not exist. Marriage is proved by the evidence of a party who was present at the celebration, or by the production of the parish register, and by establishing the identity of the parties. For the legal effect produced by marriage on the property of the parties contracting it, see HUSBAND AND WIFE; and for the causes which may procure a dissolution of marriage, see DIVORCE.

In Scotland marriage is a civil contract completed by consent alone. As regards the ceremony, it may be either regular, clandestine, or by mere consent, without the intervention of a clergyman. A clandestine differs from a regular marriage in not being preceded by the publication of banns. Consent without *copula,* or a promise to marry followed by copula, constitutes a marriage in Scotland; but in the latter case the copula must be proved, for where this has not followed the engagement may be resiled from,

the party aggrieved being entitled to sue for damages for breach of promise. An acknowledgment in writing may constitute a marriage, or an acknowledgment to the midwife who delivered, or to the clergyman who christened a child born to the spouses. The written acknowledgment must have been produced and acted on during the life of both parties. Cohabitation infers marriage if the parties are habit-and-repute husband and wife, and entitles the woman to a third part of the movable property on the death of her reputed husband. Consent *de præsenti*, cohabitation, and habit and repute, may all be proved by parole evidence; but a promise to marry can only be competently proved by writ or oath of party. No irregular marriage is valid unless one of the parties has, at the date of the marriage, his or her usual place of residence in Scotland, or has lived there for twenty-one days preceding the marriage (19 and 20 Victoria, cap. xcvi., 1856). The registration of marriages is regulated by cap. cix. of the same act. It will thus be seen that it is sometimes difficult to prove marriage in Scotland, as the fact depends on a lengthened course of conduct admitting indefinite variations, according to the number and variety of which is the difficulty of proof.

The law of marriage in Ireland is identical with that of England, except where a Protestant marries a Roman Catholic. The statute 19 Geo. II. cap. xiii. made the marriage of two Protestants by a Roman Catholic priest void, and also a marriage between a Roman Catholic and any person who had professed him or her self to be a Protestant at any time within the preceding twelve months. By the statute 33 Geo. III. cap. xxi., before a Roman Catholic priest can marry a Protestant and Roman Catholic, or any person who has been or professed to be a Protestant at any time within twelve months before such marriage, they must have been first married by a clergyman of the Protestant religion: and if he disobeys this law he incurs a penalty of £500. 33 and 34 Vict. cap. cx., 10th August, 1870, repeals so much of 19 Geo. II. cap. xiii. as respects marriages between a Protestant and a Roman Catholic when celebrated by a Roman Catholic priest.

In the United States marriage is regarded as being entirely based on contract or on the present mutual consent of the parties; solemnization by a clergyman or by a magistrate, the presence of witnesses, and all the customary forms and ceremonies being simply convenient means of perpetuating the evidence of the contract. Marriage with a deceased wife's sister is not prohibited. The age at which a marriage may be contracted is the same as in England.

MARROW. See MEDULLA.

MARRYAT, FREDERICK, a well-known novelist and distinguished naval officer, the son of an eminent West India merchant, was born in London on 10th July, 1792, and in 1806 entered the navy as midshipman on board the *Impérieuse*, commanded by Admiral Cochrane, afterwards Lord Dundonald. During his service under this illustrious officer he was concerned in more than fifty engagements, and for his gallantry in the Mediterranean, and afterwards in the defence of the Castle of Trinidad, he was honourably noticed and recommended by Lord Cochrane. In 1812 he received his promotion to the rank of lieutenant, in 1814 took part in an expedition to New Orleans, and the following year was made commander. For some time subsequent to 1820 he was actively engaged in the preventive service. In the first Burmese war he led the attack on Rangoon, as commander of the *Arachne* and senior officer of the naval force. The decoration of C.B. was conferred on him in 1825. From 1828 to 1830 he commanded the *Ariadne* in the Channel and Western Islands. That he was not raised to higher professional rank is said to have resulted from the free expression of his opinions against the practice of impressment. His first attempt in literature was made in 1829, by the publication of Frank Mildmay or the Naval Officer. Its success stimulated him to further exertions of the like kind, and the King's Own, Peter Simple, and Jacob Faithful followed each other in rapid succession. Subsequent works of fiction were Japhet in Search of a Father, Newton Forster, Midshipman Easy, The Pacha of Many Tales, The Poacher, The Phantom Ship, Snarley-Yow or The Dog Fiend, Percival Keene, Masterman Ready, Poor Jack, and others. He also made a tour in America, and published an account of it in 1839, under the title of A Diary in America, in two series, which, like Mrs. Trollope's similar work, gave not a little offence to the people of the United States. He is also the author of a Code of Signals for the Use of Vessels employed in the Merchant Service (1837), a highly useful publication, for which he received the thanks of the Shipowners' Society, and the gold cross of the Legion of Honour from King Louis Philippe. Captain Marryat's novels are remarkable for the fun and broad humour pervading them, provoking laughter from the most stolid or melancholy temperament. For fidelity of description, likewise, as regards sailors and sea life, they are unrivalled; but he cannot be said to be a great master of plot, and his incidents and characters frequently transgress all limits of probability. The loss of his eldest son, a lieutenant in the navy, who perished on board the *Avenger* in 1847, pressed heavily on his system, which had already sustained a severe shock by the rupture of a blood-vessel, and he expired at his residence, Langham, Norfolk, on 2d August, 1848. Captain Marryat was a fellow of the Royal Society. One of his daughters has gained distinction as a novelist.

MARS, contracted from *Mavers* or *Mavors*, in the Sabine or Oscan language *Mamers*, was at an early period identified by the Romans with the Greek *Ares*. As the Italian Mars was originally a divinity of a very different nature, the two conceptions must be treated separately.

Originally Mars was an agricultural deity surnamed *Silvanus*, and propitiatory sacrifices were offered to him as the tutelary god of fields and flocks. As the Italian shepherds were familiar with war, the transition from the idea of Mars as an agricultural to that of a warlike deity was natural and easy. Like Jupiter he was designated *father* (*Marspiter* and *Maspiter*), and was one of the three tutelary divinities of Rome, to each of whom Numa appointed a flamen. He was regarded as the father of the Roman people, for, according to tradition, Romulus and Remus, the founders of Rome, were the fruit of his intercourse with Rhea Sylvia. Several temples in Rome and the Campus Martius were dedicated to him, the most important of which was that outside the Porta Capena, on the Appian Road, and that of Mars Ultor, built by Augustus in the forum. His service was celebrated not only by particular *flamines* devoted to him, but by the College of the Salii, or priests of Mars. The month of March, the first month of the Roman year, was sacred to him, and his festivals were celebrated every year in the circus on the 1st of August. The Campus Martius, where the Roman youth engaged in athletic and military exercises, was named after him. Among the Romans soldiers, and gladiators, and fire were sacred to him; also horses, birds of prey, vultures, cocks, woodpeckers, and wolves; the *suovetaurilia* were also in honour of him. In peace they called him *Quirinus*, from the ancient sanctuary dedicated

to him on the Quirinal Hill; in war, *Gradivus* (the striding).

ARES, the Greek god of war, was the son of Zeus and Hera, and the father of Harmonia by Aphrodite. Deimos (*Horror*) and Phobos (*Fear*) were his sons. Phobos is his constant companion in war; Phobos and Deimos harness the steeds to his chariot, and guide him to the fight. Enyo, the destroyer of cities, and Eris always hover around him in battle. He loves war for its own sake, and delights in the din of battle, the slaughter of men, and the destruction of towns. He is not influenced by party spirit, nor is he always successful, for he was compelled to flee with the other gods before Typhœus, and to escape his fury changed himself into a fish. In the fight with Otus and Ephialtes, the sons of Aloeus, he was taken and confined in a brazen prison, where he languished thirteen months, until he was delivered by Hermes. He engaged in combat with Heracles for the protection of his son Cycnus, and was wounded. Having slain Halirrhotius, the son of Poseidon, for offering violence to his daughter Alcippe, Poseidon accused him before the twelve gods, who judged the cause on a hill near Athens (Areiopagus, Hill of Ares, or Mars' Hill, as it is called in the New Testament), and acquitted him. As Ares was the first who was tried in this place it derived its name from that circumstance. In the Trojan war he was wounded by Diomedes, and bellowed like 10,000 men united. He fought also against Athena, and hurled his spear against her ægis; she smote him to the ground with a rock. Ares is represented as a youthful warrior of strong frame, either naked or clothed with the chlamys. His attributes are a helmet, a spear, a sword, and a shield.

MARS, of the superior planets that which lies nearest the sun. He moves round the sun in 686·9797 of our mean solar days, at the average distance of 139,312,000 miles, his greatest and least distances being 152,284,000 and 126,340,000 miles; his orbit is inclined to the ecliptic at an angle of 1° 51′ 5″; his distance from the earth varies from about 35,000,000 to 244,000,000 miles; he rotates on his axis in 24 hours 37 minutes 22 seconds; the inclination of his axis, or the angle between his equator and his orbit, is 28°; his diameter is about 4400 miles. As Mars is seen by reflected light he exhibits phases, but not to the same extent as the inferior planets. The favourable circumstances under which he is seen have made us better acquainted with his surface than that of any other planet; Venus is nearly invisible when nearest us, but Mars, in opposition, is seen at midnight. His synodic period is 780 days, so that he comes to opposition, and therefore reaches his maximum brilliancy, every 2 years 7 weeks. His surface resembles that of the earth, but the seas, as the parts which have a greenish tinge are thought to be, cover a much smaller area than the reddish parts or land. Much of the red light seems to be due to absorption by the aqueous vapour of his atmosphere, as is the red colour of our setting sun on the earth. The fiery red light of Mars is very striking when in opposition, so that he was celebrated among all historic nations. About every 8 years 7 months he is in perihelion and perigee at the same time, and has a wonderful brilliancy. In August, 1719, his brightness was such as to cause a panic. At his poles are white portions, which decrease and increase in size at the beginning and end of the Martial summer, so that the poles are supposed to be surrounded with snow. On account of the great eccentricity of the orbit of Mars, the lengths of summer in the northern and southern hemispheres differ very considerably. The duration of the seasons of the northern hemisphere in Martial days is—spring 192, summer 180, autumn 150, winter 147. In August, 1877, when Mars was nearer the earth than it had been since 1845, two satellites of the planet were discovered, both very small bodies. The outer one, discovered on the 11th of August, is 14,500 miles distant from the centre of Mars, and revolves round the planet in a period of 30 hours 14 minutes. The inner one, discovered on the 18th of the month, is at a distance of 5800 miles from the centre of Mars, and has a period of 7 hours 38 minutes. The discovery of both bodies is due to Professor Hall, of the United States Naval Observatory, Washington. It may be mentioned as a curious coincidence that Voltaire in his Micromegas, in which he gives an account of the supposed travels through the universe of an inhabitant of Sirius and an inhabitant of Saturn, states that the two explorers, passing the planet Mars, saw two satellites of that planet so small that they had hitherto escaped the telescopes of terrestrial astronomers. A map of Mars on Mercator's projection has been constructed by Schiaparelli of Milan on the basis of observations taken by him between Sept. 1877, and March, 1878.

MARS, ANNE FRANÇOISE HYPPOLITE BOUTET, usually called *Mademoiselle Mars*, one of the most celebrated of modern French players, the daughter of members of the same profession, was born at Paris, February, 1779. As Célimène in Molière's Misanthrope, and Elmira in Tartuffe, as well as in several similar characters in the plays of Marivaux, she was absolutely perfect. Louis XVIII. settled on her, as well as on Talma, a pension of 30,000 francs. She quitted the stage in 1841, and died at Paris, 20th March, 1847.

MARSALA (anciently *Lilybæum*), a seaport town, Sicily, near the mouth of a river of same name, on the low promontory of Cape Boeo, 18 miles S.S.W. of Trapani. It obtained its present name from the Saracens, who valued the port so highly that they gave it and the town the name of Marsa Alla, or Port of God. It is of a square form, surrounded by ancient walls flanked with bastions, and is substantially built, including among others a spacious and regular central street, which divides the town into two nearly equal parts. The principal edifices are a large cathedral, with sixteen marble Corinthian columns, said to have been intended for the church of Thomas à Becket in England; a college, several convents, and an hospital. The harbour, once celebrated, has been silted up so as to admit only small vessels. The trade is chiefly in corn, oil, wine, fruit, and barilla. Marsala was the chief fortress of the Carthaginians in Sicily, and under the name of Lilybæum figures much in the Punic wars. Pop. (including suburbs), Dec. 31, 1881, 19,732.

MARSDEN, WILLIAM, born in Dublin, on the 16th of November, 1754, was sent out early in life as a writer, to the island of Sumatra, where he rose to be chief, and gained much information respecting the language, manners, and antiquities of the Oriental Archipelago, a part of which he communicated in articles sent by him to the Royal and Antiquarian Societies. The chief of these are, On a Phenomenon observed in the Island of Sumatra; Remarks on the Sumatran Language; Observations on the Language of the People commonly called Gipsies; On the Hejira of the Mohammedans; On the Chronology of the Hindoos; and On the Traces of the Hindoo Language and Literature extant among the Malays. His separate publications are, the History of Sumatra (1782); a Dictionary of the Malayan Language, in two parts, Malayan and English, and English and Malayan (1812); and a Grammar of the Malayan Language; to which is prefixed an interesting Discourse on the History, Religion, and Antiquities of the Oriental Islands. In 1817 he published his Trans-

lation of the Celebrated Travels of Marco Polo, accompanied by a valuable commentary. In 1823 he published the first part, and in 1825 the second, of his Numismata Orientalia, or Description of Eastern Coins. He died 6th October, 1836.

MARSEILLAISE HYMN, the celebrated song of the patriots and warriors of the French revolution, was composed, at the request of the Mayor of Strasbourg, by M. Joseph Rouget de Lisle, while an officer in the engineer corps at Strasbourg, early in the French revolution, with a view of supplanting the vulgar songs then in vogue relative to the struggle then going on, and to animate a column of volunteers which was about to leave the city. He composed the song and the music in one night. It was at first called Chant de guerre de l'armée du Rhin, but subsequently received its present name because it was first publicly sung by the Marseilles confederates in July, 1792. It became the national song of the French patriots and warriors, and was famous through Europe and America. The tune is peculiarly exciting. It was suppressed under the empire and the Bourbons, but the revolution of 1830 called it up anew, and for a few years it was the recognized national song of the French. Louis Philippe bestowed on its composer, who was about seventy years old at the time of the revolution of 1830, having been born in 1760, a pension of 1500 francs from his private purse. M. Rouget de Lisle had been wounded at Quiberon, and persecuted by the terrorists, from whom he had escaped by fleeing to Germany. The celebrity of the Marseillaise Hymn, and the important influence which it once exerted, induce us to give it at length.

Allons enfants de la patrie:
Le jour de gloire est arrivé:
Contre nous de la tyrannie
L'étendard sanglant est levé
Entendez-vous dans les campagnes
Mugir ces féroces soldats?
Ils viennent jusque dans nos bras,
Egorger nos fils, nos compagnes.
Aux armes, citoyens! formez vos bataillons:
Marchons;—qu'un sang impur abreuve nos sillons.

CHŒUR.

Aux armes, citoyens! formons nos bataillons:
Marchons,—qu'un sang impur abreuve nos sillons.

Que veut cette horde d'esclaves,
De traîtres, de rois conjurés?
Pour qui ces monstres ces entraves,
Ces fers dès longtemps préparés?—
Français, pour nous, ah! quel outrage!
Quels transports il doit exciter!
C'est nous qu'on ose méditer
De rendre à l'antique esclavage!
Aux armes, &c.

Quoi! ces cohortes étrangères
Feraient la loi dans nos foyers!
Quoi! ces phalanges mercenaires
Terrasseraient nos fils guerriers!—
Grand Dieu! par des mains enchaînées
Nos fronts sous le joug se ploieraient!
De vils despotes deviendraient
Les arbitres de nos destinées!
Aux armes, &c.

Tremblez, tyrans! et vous, perfides,
L'opprobre de tous les partis;
Tremblez!—vos projets parricides
Vont enfin recevoir leur prix!
Tout est soldat pour vous combattre:
S'ils tombent, nos jeunes héros,
La France en produit de nouveaux,
Contre vous tous prêts à se battre.
Aux armes, &c.

Français, en guerriers magnanimes,
Portez ou retenez vos coups;
Epargnez ces tristes victimes
A regret s'armant contre nous;—
Mais ces despotes sanguinaires,
Mais les complices de Bouillé—
Tous ces tigres qui, sans pitié,
Déchirent le sein de leur mère!
Aux armes, &c.

Amour sacré de la patrie,
Conduis, soutiens nos bras vengeurs
Liberté, Liberté chérie,
Combats avec tes défenseurs.
Sous nos drapeaux, que la victoire
Accoure à tes mâles accents!
Que tes ennemis expirants
Voient ton triomphe et notre gloire.
Aux armes, &c.

MARSEILLES (Latin, *Massilia*; French, *Marseille*), a city and the principal commercial seaport of France, on the Mediterranean, capital of the department of Bouches-du-Rhône, on the north-eastern shore of the Gulf of Lyons, at the head of a bay the entrance to which is sheltered and defended by a group of islets, 408 miles S.S.E. of Paris. It naturally divides itself into the old town on the west, and the new town on the east. The surface covered by the former is very uneven, and the streets are narrow and irregular. The new town, on the opposite side, is traversed north to south by a long and splendid street, commencing at the Aix Gate, and terminating at the Place Castellane. Almost all the other streets are spacious and regular, and lined with handsome houses. Between the old and new towns is a street or promenade, called the Grand Cours, planted with a double row of trees, adorned with fine fountains, and bordered with many elegant mansions. It forms the great place of resort. Marseilles is not rich in public edifices. The most deserving of notice are the church of La Major, regarded as the oldest in the town, and supposed to occupy the site of a temple of Diana; the church of St. Victor, also of great antiquity; the lofty belfry, all that the atrocity of the Jacobins in 1793 has allowed to remain of the once beautiful Gothic church of the Accoules; the church of Chartreux, situated without the town, but unquestionably the finest of which it can boast; the Hôtel de Ville, a heavy building, overloaded with tasteless ornaments; the Prefecture, a large edifice, considered by some to be the handsomest in Marseilles, and surrounded by a well-laid-out garden; the museum, observatory, library, and two theatres. Not unworthy of notice also are the public fountains, the triumphal arch through which the town is entered on the side of Aix, and the spacious and well-constructed quays, with their commodious warehouses. Marseilles is the see of a bishop, and possesses a court of first instance, a mint, an Academy of Sciences, Belles-letters, and Arts, various learned societies and educational institutions. The harbour is one of the finest in France, and is defended by two forts.

In recent times Marseilles has made great progress in its extent, improvement, population, and commerce, largely owing to the conquest of Algeria and the opening of the Suez Canal. Since 1855 four additional ports have been formed, adding, with the National Dock, nearly 200 acres to the previous harbour accommodation. In 1867 a new custom-house was built. From the Durance an abundant water supply has been derived. A canal from the summit level irrigates the neighbouring slopes and plains, and has transformed them from arid tracts into fruitful fields, producing a vegetation hitherto unknown in the district. And by the water supply and the construction of sewers, the once unhealthy and dirty town has been converted into one exceptionally clean and pleasant. Among the new buildings are a cathe-

dral, three churches, a palace, exchange, law courts, library, museum, town-house, observatory, three hospitals, and two barracks. The progress is not confined to the town, but extends to the surrounding districts, which are occupied by a new population, employed in raising vegetables, fruit, &c., on the reclaimed and improved lands.

The most important manufactures are soap, soda, and other chemical products; also olive and other oils, sugar, machinery, iron and brass work, matches, candles, glass, earthenware, oriental hosiery, &c. In the building-docks a great number of war and other vessels are built. The trade consists chiefly of soap, olive-oil, wine, brandy, corn, flour, dried fruits, oranges, and other products of the southern departments; salt provisions, tobacco, wool, skins, iron, cotton-wool, cotton twist, dye-woods, and other articles of colonial produce.

Marseilles is supposed to have been founded by a colony of Phocæans about 600 years before Christ. Its progress for centuries was rapid and almost without interruption, till, having taken the part of Pompey in the great contest for supremacy between him and Cæsar, it was besieged by the latter, and being taken, was deprived of all its peculiar privileges. On the decline of the Roman Empire it became a prey to the Goths, Burgundians, and Franks. In 735 it fell into the hands of the Saracens, who completely destroyed all the ancient monuments which previous barbarians had spared. In the tenth century it fell under the dominion of the counts of Provence, and for some centuries after followed the fortunes of that house. Pop. (1881), 360,099.

MARSHAL (in ancient German *Marschalk*), derived from the ancient German word *Mar*, a horse; and *Schalk*, a servant; hence *Marschalk*, a man appointed to take care of the horses. *Maréchal*, in French, still designates a farrier, though it also denotes a high dignity. A similar instance is the French *connétable*, from *comes stabuli* (count or master of the stable). *Marshal* signified at first a person intrusted with the charge of twelve horses under the *comes stabuli*. In France the title sunk still lower, so as to designate, as we have said, every farrier; but in other parts of Europe it rose in dignity, as horses were highly valued at courts, so that it came to signify the person appointed to the care of all the horses of a prince, and these persons being at length appointed to high commands in the army, and important posts in the state, the title came to signify one of the highest officers of the court. The marshal of the German Empire derived his origin from the Frankish monarchs, and was equivalent to the *comes stabuli* or *connétable*. He was bound to keep order at the coronation of the emperor, and to provide lodgings for the persons connected with the ceremony. He was called *arch-marshal*, a dignity belonging to the electorate of Saxony. At the coronation it was his duty to bring oats in a silver vessel from a heap in the open market-place, and to present the vessel to the emperor. His duties were discharged by a hereditary marshal (*Erbmarschall*). In France *maréchal de France* is the highest military honour; *maréchal de camp* is equal to major-general, in Austria to field-marshal. In Prussia general-field-marshal is the highest military honour. In England *field-marshal* is given as an honorary rank to general officers who may have no immediate command. *Marshal* also signifies a person who regulates the ceremonies on certain solemn celebrations. *Marshal* is also used for some inferior officers in England. The marshal of the Queen's Bench has the custody of the prison called the Queen's Bench. He attends on the court of the same name, and takes into custody all prisoners committed by it.

MARSH GAS. This gas, which is a compound of carbon and hydrogen, occurs very abundantly in nature; it is also known by the name of *light carburetted hydrogen;* its systematic name is *methane*. Marsh gas contains more hydrogen than any other compound of carbon; as will be seen by an inspection of the formula CH_4 the hydrogen amounts to one-fourth of the total weight of the gas. In accordance with the principles explained in the article CHEMISTRY carbon is regarded as a tetratomic element; in this compound (CH_4) the carbon atom is therefore completely saturated, hence the molecule CH_4 is not capable of combining directly with other atoms. It is therefore only by substitution that compounds can be formed from marsh gas; that is, by replacement of one or more atoms of hydrogen by other elements. Thus by the action of chlorine on marsh gas a series of derivatives are produced, which have the formulæ respectively CH_3Cl, CH_2Cl_2, $CHCl_3$, and CCl_4. In the same way by the substitution of the group hydroxyl (HO) for one of the hydrogen atoms we obtain the well-known body methylic alcohol CH_3HO. A great many substances may be thus derived from marsh gas.

Marsh gas is often produced during the decay of organic matter; from stagnant pools, from coal-beds, and sometimes from deposits of other kinds beneath the earth there often issue streams of inflammable gas; this gas usually consists of marsh gas mixed with varying amounts of nitrogen and oxygen. By the destructive distillation of many organic bodies, as, for instance, of coal, marsh gas is produced in large quantities. In the laboratory this gas is usually prepared by distilling sodium acetate along with caustic potash; the reaction may be represented thus—

$$\left.\begin{matrix} C_2H_3O \\ Na \end{matrix}\right\}O + HKO = KNaCO_3 + CH_4.$$

By decomposing zinc methyl with water marsh gas may be obtained in a very pure condition—$CH_3Zn + H_2O = CH_4 + ZnHO$.

Marsh gas has a specific gravity of ·5576, next to hydrogen it is the lightest known substance; it is colourless, it has not as yet been condensed, it is tasteless and odourless, and it is without action on test-paper. Marsh gas is very inflammable, burning with a scarcely luminous flame, and giving rise to the formation of carbon dioxide and water.

Marsh gas forms the first member of a highly important series of homologous hydrocarbons, represented by the general formula CnH_{2n+2}. See HOMOLOGOUS BODIES and HYDROCARBONS.

MARS' HILL. See AREOPAGUS.

MARSH-MALLOW (*Althæa*), a genus of plants of the natural order Malvaceæ, with a double calyx, the outer whorl of which has from six to nine sepals, whilst the inner has only five. The only species which is an undoubted native of Britain, and which is found abundantly in the south, is the *A. officinalis*, a common European plant, growing in marshes, especially near the sea, in great abundance. It is employed medicinally as a demulcent and emollient, and is the Guimauve of the French, used by them in the preparation of the demulcent lozenges known as *Pâtes de Guimauve*. It is perennial, having a white, fleshy, carrot-shaped root, which in seasons of scarcity is used in some eastern countries as a wholesome and palatable article of food. The stems, which are from 2 to 3 feet high, as well as the leaves, are densely covered with a soft down, which gives the plant a hoary aspect. The leaves are divided into three or five shallow, serrated lobes, and the flowers, of a pale rose colour, appear in short clusters from the bosom of the leaves. The hollyhock (*A. rosea*) is another species. See HOLLYHOCK.

MARSH-MARIGOLD (*Caltha*), a genus of plants of the natural order Ranunculaceæ. It has five petal-like sepals, and the fruit consists of several spreading, compressed, many-seeded follicles. *C. palustris*, known indifferently as water-caltrops or marsh-marigold, is a common British plant, and is found in meadows and by the sides of wet ditches. It much resembles the Ranunculus, differing chiefly in having the calyx and corolla mixed together, and the base of the petals destitute of scales. It has kidney-shaped, shining leaves, and large yellow flowers, and partakes of the acridity common to the order.

MARSTON, JOHN, an English dramatic author, who lived in the reigns of Elizabeth and James I., was educated at Corpus-Christi College, Oxford, and was entered at the Middle Temple, of which society he became lecturer; but little more of his personal history is known, except that he was at one time upon terms of friendship with Ben Jonson, and died after 1633. He was the author of eight plays, all acted at the Black Friars with applause. Six of these were printed in one volume, in 1633, and dedicated to the Viscountess Falkland. He assisted Ben Jonson and Chapman in the composition of Eastward Hoe, a play which is in Dodsley's collection. He also wrote three books of satires, entitled the Scourge of Villany (1599), reprinted in 1764.

MARSTON MOOR, in Yorkshire, England; celebrated for the battle between the royal forces under Prince Rupert and the troops of the Parliament under Fairfax and Cromwell (2d July, 1644), in which the latter were victorious. (See CHARLES I. and CROMWELL.) 24th December, 1659, Fairfax assembled his followers on Marston Moor, after having declared for a free Parliament.

MARSUPIALIA, MARSUPIALS, one of the two orders of implacental or lower Mammalia, typically represented by kangaroos, opossums, wombats, bandicoots, &c. This order corresponds with De Blainville's subclass *Didelphia* (see MAMMALIA), and includes animals, which, with the exception of the American opossums, are absolutely confined to the Melanesian or Australian province, embracing Australia, Van Diemen's Land, New Guinea, and adjacent islands. The term 'marsupial' is derived from the Latin *marsupium*, a pouch, and applies to the characteristic pouch borne by the female animals, in which the nipples are contained, and within which the young are carried and protected for a considerable period after birth. This pouch is supported on two characteristic bones—the 'marsupial bones'—attached to the pelvis, and which are regarded by comparative anatomists as representing ossifications of the tendons of the *external oblique muscles* of the abdomen. These bones are also present in the allied order, that of the Monotremata, but in the latter case they never support a pouch. The other marsupial characters are found in the disposition of the generative organs (see MAMMALIA); in the testes of the males being contained in a scrotum suspended in front of the penis; in the furry character of the skin; and in the special features of the dentition. The following is Owen's classification of this order:—

(*a*) *Rhizophaga* ('root-eaters'), for example, wombats.

(*b*) *Poephaga* ('grass-eaters'), for example, kangaroos and kangaroo-rats.

(*c*) *Carpophaga* ('fruit-eaters'), for example, Australian bear or koala and phalangers.

(*d*) *Entomophaga* ('insect-eaters'), for example, bandicoots, opossums, banded ant-eaters.

(*e*) *Sarcophaga* ('flesh-eaters'), for example, Australian hyena, Tasmanian 'devil.' See also MAMMALIA, KANGAROO, OPOSSUM. For illustrations of marsupials see Pl. CXXI.-CXXII.

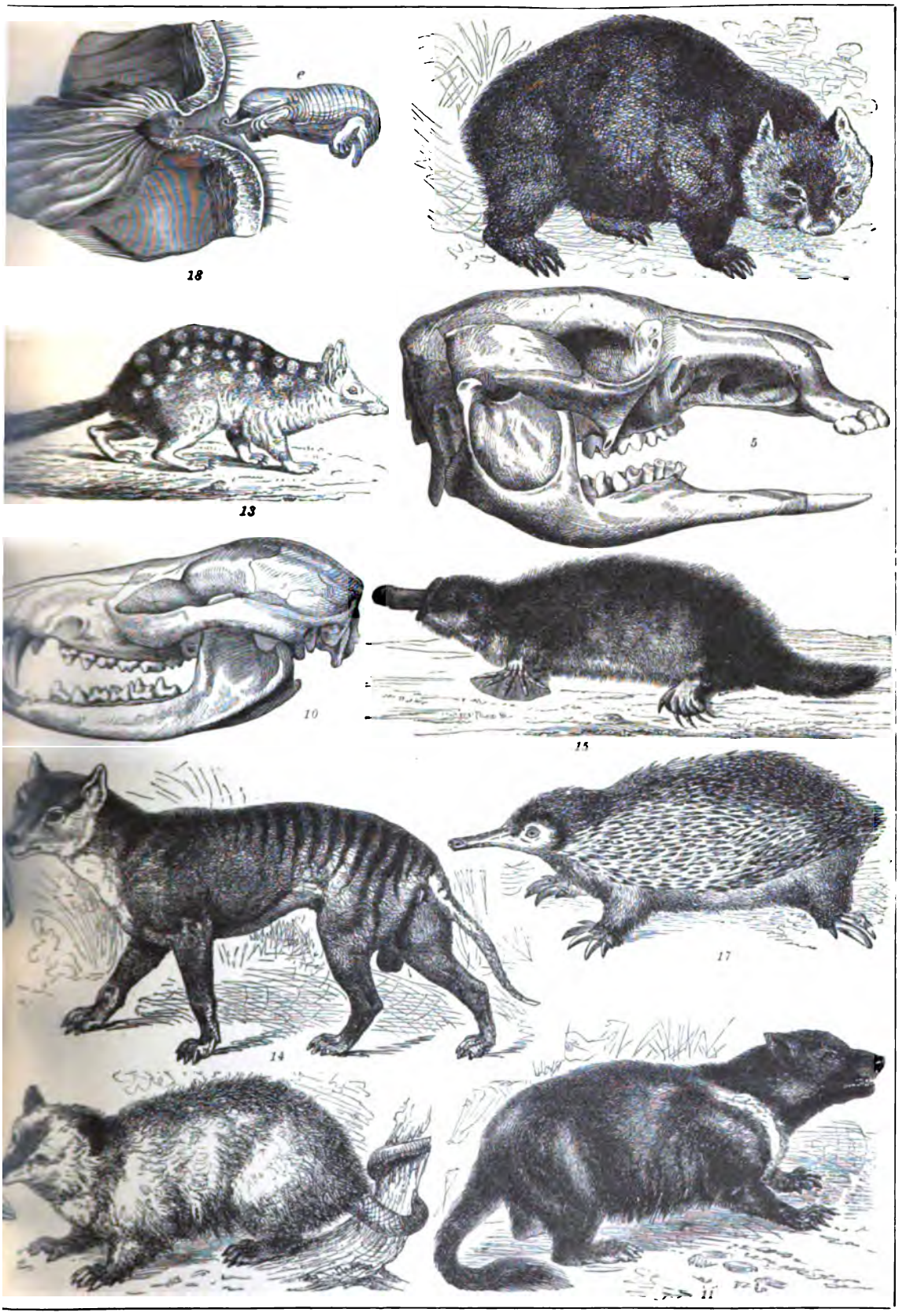
MARSYAS, a mythological personage, variously called the son of Olympos, Œagrus, or Hyagnis. Fable relates that Athena, having seen the reflection of herself in water, had thrown away the flute which she had invented, displeased because it disfigured the countenance in playing, and had pronounced the severest maledictions against any one who should take it up. Marsyas accidentally found this instrument, on which he soon acquired such skill that he dared to challenge Apollo to a contest, the conditions of which were that the victor should do what he pleased with the vanquished. The Muses, or according to others the Nysæans, were invited to be the umpires. At first the stronger music of the flute drowned the softer tones of the lyre, on which the god played; and Marsyas was on the point of winning the victory when Apollo accompanied his instrument with his voice. Marsyas was unable to do the same with his flute. The Muses decided in favour of Apollo, who put to death his rash competitor by binding him to a tree and flaying him alive. In this way was the curse of Athena accomplished. Many ancient and modern artists have represented the contest, as well as the punishment of Marsyas.

MARTABAN, a town in British Burmah, capital of a province of same name, on the right bank and near the mouth of the Saluen River. It consists chiefly of two long streets, and has some conspicuous temples. On its right is a rocky mound surmounted by a two-gun battery, with a deep nullah or water-course beneath. Martaban was captured by the British in 1824, and again in 1852. Its trade has been long since transferred to Moulmein, from which it is only about 10 miles distant.

MARTELLO TOWERS, so called by corruption from *Mortella*, in Corsica, where a strong tower maintained a determined resistance to a superior English force in 1794. In consequence of the great strength exhibited by this fort the British government erected a number of similar towers round the coast of Britain, and especially on the Kentish coast, as a defence against the threatened invasion from France. They are circular, with walls of great thickness, and roofs bomb-proof, and consist of two stories, the lower for the reception of stores, and the upper for the casement of troops. One traversing gun is mounted upon each, in working which the men are secured by a lofty parapet. The towers are surrounded by a deep dry fosse: the entrance is by a door several feet from the ground, approach to which is then cut off by drawing up the ladder. The ordinary guard consists of from six to twelve men. Martello towers were at one time considered to have been a failure, and in many places were dismantled, but recently several of them have received a new and more powerful armament.

MARTEN (*Mustela*). This term has been popularly used to denote the Weasel family in a general sense. Zoologically and properly it is employed to distinguish a genus included in the Mustelidæ or Weasel family, which division forms a group of the carnivorous order of Mammalia. Like the weasels themselves the body of the martens is elongated and slender. The legs are short, the feet being provided with five toes, armed with sharp claws. In habit the martens differ from the weasels in being arboreal; these forms climbing trees with great ease. The Common Marten (*Martes* (*Mustela*) *foina*) is found in Britain and Europe generally, as also is the Pine Marten (*M. abietum*), although the latter is rarer in Britain. The former breeds in hollow trees, and produces from three to seven young at a birth. They feed on the smaller wild Mammalia, such as rats, mice, &c., but also attack birds and devour eggs. They are said to be fond of honey, and even to eat

1. Two toed Sloth. *2.* Skull of Aardvark. *3.* Kangaroo. *4.* Skeleton of do. *5.* Skull of do. *6.* Female Opossum with young [illegible] *7.* Skull
13. Mangé's Dasyure. *14.* Tasmanian Wolf. *15.* Ornithorhynchus *16.* Skull



* Reproductive Organs of do. 8. Wombat 9. Opossum. 10. Skull of do. 11. Tasmanian Devil. 12. Flying Phalanger.
of do. from below. 17. Echidna hystrix. 18 Lacteal Gland and young of do.

fruits and grain. The pine marten occurs chiefly in North America and in the northern parts of Asia. It is of smaller size than the common marten, has a finer fur, and possesses a yellowish mark on the throat. It burrows in the ground, carries the young about six weeks, and brings forth from four to seven in a litter about the end of April. The fur is used for trimmings, and upwards of 100,000 of these animals are annually hunted and killed in the fur countries. The famous Sable Marten (*M. Zibellina*), which furnishes the highly valuable sable fur, is nearly allied to the pine marten. It inhabits Siberia, and vast numbers of this species are killed annually for the sake of the fur. The pursuit of these animals is described as a task involving much difficulty, discomfort, and even peril. The American sable is furnished by the *M. leucopus*, and Pennant's Marten (*M. Canadensis*), or the *Fisher*, as it is popularly called, is another well-known species. This latter form inhabits the vicinity of lakes and rivers, and its distribution ranges from Pennsylvania to the Great Slave Lake. From two to four young are produced annually at a birth. The martens possess a faint musky odour, but do not emit the offensive odours of allied forms, such as the skunks, polecats, &c. (Pl. XXXI.–XXXII. figs. 15, 16.)

MARTHA (Santa), or Marta, a seaport town of South America, Colombia, state of Magdalena, on the Caribbean Sea, 105 miles north-east of Cartagena. It has some good houses, a cathedral, and a good harbour, with safe anchorage, defended by a castle and batteries. A considerable trade is carried on here with the neighbouring Indians, who bring earthenware and cotton stuffs. Earthquakes are frequent. Pop. 8000.

MARTHA'S VINEYARD, an island of Massachusetts, on the south side of Cape Cod, 12 miles west-north-west of Nantucket, 19 miles long, and from 2 to 10 broad. The greatest part of the island is low and level, and but a small part of the land is good. The principal manufactures are those of wool and salt. The island contains three towns, Edgartown, Tisbury, and Chilmark. On the north side of the island is the harbour of Holmes' Hole.

MARTIAL (Marcus Valerius Martialis), the most celebrated of the Roman epigrammatical writers, was born at Bilbilis, in Celtiberia, A.D. 43, and educated at Calagurris (*Calahorra*), the birth-place of his friend Quinctilian. He went to Rome when young, during the reign of Nero, and lived under the reign of Galba and the following emperors; from some of whom he received marks of esteem and favour. Domitian gave him the rank of tribune and the rights of the equestrian order, and made his circumstances more easy by presents. Martial continued to reside in Italy till 100 A.D., when he returned to Spain to his native city. He died there not earlier than 104 A.D. His celebrity is founded on fourteen books of epigrams, of which he himself modestly says, 'Sunt bona, sunt quædam mediocria, sunt mala plura.' The number and value of his epigrams give a high idea of the wit of the poet. Most of them are ingenious and cutting; many are full of grace and Attic salt; and many, in which he chastises the vices of his age, are extremely indecent. He is the true father of modern epigram, which is distinguished from the simple Greek epigram by the convergence of all its parts to one witty point. The best edition of his works is that of Schneidewin (Grimma, 1841, two vols. 8vo). There is no good translation of the whole into English, but there are numerous translations of different epigrams scattered through the works of the English poets.

MARTIAL LAW. The law martial applies to soldiers in actual service, and in Britain is founded upon particular statutes. Chief-justice Hale, in his History of the Common Law, chap. ii. says it is a body of rules, and a jurisdiction rather indulged by the law than constituting a part of it. But it does not appear why it is not a part of the law of the land, as much as the law merchant or any other branch of law. It is true it applies only to persons in actual military service, and only to their conduct in such service; but so the maritime law applies only to persons engaged in maritime trade, and has reference only to acts done, or obligations arising, in that trade. The jurisdiction under the law martial is in a distinct tribunal, and the mode of proceeding is different from that which prevails in the common law and in equity jurisdiction; the tribunal for the trial of offences against the military law being a court-martial appointed by some superior officer. A military code, and also a special tribunal for the trial of offences against its provisions, are absolutely necessary for the government and regulation of an army, since the offences to which such a code relates are quite different from those cognizable by the common law, and are such that the ordinary tribunals are not fitted to have jurisdiction of them: the proceedings, too, must be more summary than is practicable before the standing judiciary.

MARTIGUES, Les, a seaport town in France, in the department of Bouches-du-Rhône, at the entrance of the lagoon of Berre, 16 miles W.N.W. of Marseilles. Its situation has procured it the name of the Little Venice of Provence (*La Petite Venise de Provence*), being built partly upon an island, and composed of three little towns, which seem to float upon the bosom of the waves, and communicate with each other by bridges. The houses are well built, and the streets are, in general, regularly laid-out. It has a good harbour, much frequented by small coasting vessels; and excellent building docks, in which a considerable number of merchantmen are built. Many of the inhabitants live by fishing. Pop. 6483.

MARTIN. Of five popes of this name the most important are—

Martin I. of Todi in Tuscany, who was educated with care, and elected pope in 649. At a synod of Italian bishops in the Lateran church at Rome he caused the Monothelites and the *ecthesis* of the Emperor Heraclius in their favour, as well as the *typus* in which the Emperor Constans II. endeavoured to put an end to all religious discussions, by prohibiting them, to be solemnly condemned. He was, in consequence, seized by the exarch of the Byzantine emperor, and taken first to the island of Naxos (653), and then to Constantinople (654), where he was condemned to death as a traitor. At the request of the patriarch Paulus the punishment of death was transmuted into that of banishment. Martin was deprived of all marks of his dignity, exposed to the contumelies of the people and soldiers, and banished to the Tauric Chersonese, where he died in 655. On account of these sufferings he was numbered among the saints. We have eighteen epistles of his of little value. His day is the 12th of November.

Martin V., of the ancient family of Colonna, was chosen pope in 1417, after the abdication of Gregory XII., and the deposition of John XXIII. and Benedict XIII., during the Council of Constance. No one of his predecessors or followers has ever been consecrated with such solemnity. He rode on a white horse, which the Emperor of Germany and the Elector of the Palatinate, both on foot, led by the bridle. A number of princes and a whole council formed his retinue. His first act was to promulgate a bull against the Hussites, which is remarkable from the circumstance that in it the pope seems to recognize the supreme authority of the councils. In 1418 he

dissolved the Council of Constance, though a number of difficulties were not adjusted, and dissensions continued in the church. Benedict XIII. still lived; and at his death, in 1424, a new antipope was elected in Clement VIII., who first renounced his pretensions in 1429, when he received the Bishopric of Minorca as an indemnification. A council which Martin V. convened at Pavia in 1424, and thence removed to Siena, was dissolved, without having established anything. He died soon after, in 1431. He has the merit of having restored unity to the church, and pacified Italy. We yet possess some works of his.

MARTIN, JOHN, a celebrated painter, was born near Hexham, on the Tyne, a few miles above Newcastle, on 19th July, 1789. His determination from the first was to be a painter, but the first approach which he made towards realizing this idea was in being apprenticed to a coachmaker in Newcastle, for the purpose of learning heraldic painting. He then became pupil of Bonifacio Musso, an Italian artist in Newcastle, with whom he removed to London in 1806. After leaving the residence of Musso, Martin supported himself by painting on glass and on china, and by teaching. At the age of nineteen he married. His first picture, entitled Sadak in Search of the Waters of Oblivion, was exhibited in 1812. This was followed by Paradise, The Expulsion from Paradise, Clytie, and Joshua commanding the Sun to Stand Still. The last, though only hung in the anteroom of the Royal Academy, thereby occasioning a lasting rupture between the artist and the directors, was exhibited the following spring at the British Institution, and gained the prize. The Fall of Babylon was produced in 1819, and excited great attention, only surpassed by Belshazzar's Feast, which was exhibited in 1821, and obtained the prize of £200 at the British Institution. Among Martin's subsequent pictures may be mentioned The Destruction of Herculaneum, The Seventh Plague, The Creation, The Deluge, The Fall of Nineveh, The Death of Moses, The Celestial City and River of Bliss, Pandemonium, Morning and Evening, The Valley of the Thames from Richmond Hill, and Canute Rebuking his Courtiers. He died at Douglas, in the Isle of Man, in 1853, and leaving behind him three large unfinished pictures, The Last Judgment, The Great Day of Wrath, and The Plains of Heaven. Besides these and other pictures Martin painted a number of elaborate water-colour landscapes, and also executed the illustrations for some books, including more especially Milton's works and the Pilgrim's Progress. For the former he is said to have received the sum of 2000 guineas. He also took a great interest in the sanitary improvement of London, and came repeatedly before the public with plans and proposals on the subject.

MARTIN, ST., the most famous of this name, was born of heathen parents at Sabaria, in Pannonia (now *Stein*, in Lower Hungary), about the year 316. He attended the catechetical school at Pavia. His father was a military tribune, and compelled him in his sixteenth year to take up arms. He is said to have early escaped from his father, and received instruction in a Christian church. While a soldier his life was marked with the rigour of a monk. He served under Constantius and Julian, and went to Gaul, where he appeared as the model of all virtue. Among other acts he divided his cloak with a poor man whom he met at the gates of Amiens (Ambianum). The legend says that Christ appeared to him in the following night covered with the half of this cloak. Soon after this vision Martin was baptized, in 337. After living many years in retirement he made a visit to his native place, during which he converted his mother, and opposed with zeal the Arians who prevailed in Illyria. For this he was scourged from the country, on which occasion he manifested the firmness of a martyr. He now established a monastery in Milan, but when he found himself again exposed to persecution took refuge on the Island of Gallinaria, in the Ligurian Sea. He next settled at Poitiers, where he assembled a number of monks, and is said to have wrought many miracles. In the year 375 (according to others 371 or 374) the Bishopric of Tours was conferred on him against his will. In order to withdraw himself from the world he built the famous convent of Marmoutiers, between the Loire and a steep rock. This is regarded as the oldest abbey of France. He is said to have died about the year 400, at Candes, in Touraine. St. Martin was the first to whom the Roman Church offered public adoration. His eloquent protest against the martyrdom of Priscillian speaks well for the liberality of his character. His festival takes place on the 11th of November. (See MARTINMAS.) The Professio Fidei de Trinitate attributed to St. Martin is regarded as spurious.

MARTIN, ST., one of the Leeward Islands, West Indies, between the islands of Anguilla and St. Bartholomew, belonging partly to the French and partly to the Dutch. Its form is nearly that of an equilateral triangle: its sides being each 7½ miles in length. Area, 30 square miles. It is deeply indented with bays and lagoons, some of which afford good anchorage, and is, upon the whole, hilly. The highest part is the table-land in the centre, 1361 feet above sea-level. In the southern part are salt-water lagoons, from which great quantities of salt are obtained by the Dutch. The climate is considered healthy. The principal produce is salt, sugar, rum, and tobacco, the last of excellent quality. Nearly all the inhabitants are English; the remainder are French and Dutch, who form the poorer section of the population. The language and customs are English in both the French and Dutch parts. The French and Dutch made a settlement on this island in 1638; they were expelled by the Spaniards, who themselves abandoned it in 1650. The French and Dutch reclaimed it at the same time, and at last agreed to divide it. During the wars with Napoleon it was several times in the possession of the English, but in 1814 was restored to its original possessors. Pop. of the northern or French division, 3481; of the Dutch or southern division, 3126.

MARTINA FRANCA, a town in the Kingdom of Italy, in the province of Lecce, 18 miles north-east of Taranto. Silkworms are reared in the neighbourhood, and there is a considerable trade in cereals and cocoons. Pop. 13,088.

MARTINIQUE, one of the French West India Islands, in the Windward group, 30 miles south by west of Dominica, and 20 miles north of St. Lucia. It is of irregular form, high and rocky, about 45 miles long and 10 to 15 broad; area, 380 square miles. Its loftiest summit, Mount Pelée, is 4450 feet high. There are six extinct volcanoes on the island, and one of the craters is of large dimensions. Extensive masses of volcanic rocks cover the interior, rise to a great elevation, and extend from the mountains to the shores of the sea, where they form numerous deep indentations along the coast. Between the volcanic rocks broad irregular valleys of great fertility occur. Those on the western side, called Basseterre, are more extensive, fertile, and level than those on the eastern side, called Cabesterre. The climate is hot, but not unhealthy, being tempered by regular breezes. Hurricanes and earthquakes are not unfrequent. About two-fifths of the island are under cultivation, the remainder being covered with trees or occupied by naked

rock or disintegrated pumice-stone. Agriculture has made great progress in the colony. The principal object of cultivation is the sugar-cane, which occupies about two-thirds of the arable land. Manioc, yams, bananas, sweet-potatoes, coffee, and cacao are also cultivated. The coffee of Martinique is almost as highly esteemed as that of Arabia. The mountain slopes are in most parts covered with primeval forests. In other parts the slopes are cultivated to the height of about 1400 feet. Numerous streams flow down from the heights, most of them mere rivulets, except during the rainy season, which lasts from the middle of July to the middle of October, when they become impetuous torrents. A few are navigable for boats for a short distance from their mouths, and used for the conveyance of produce to the shipping. The island has several good harbours, the best of which is Port Royal, on the south-western side of the island. Although amongst the best in the Caribbees, it is much impeded by shoals. There is a regular service of packet-boats between the Island of Martinique and Saint-Nazaire in the mother country. The principal town is St. Pierre, on the north-western side of the island. Since 1870 Martinique has sent two deputies to the National Assembly of France. The island was discovered by the Spaniards on St. Martin's Day in 1493, when it was peopled by Caribs, who called the island Madiana. In 1635 it was settled by the French, who eventually extinguished the aboriginal race. It was subsequently taken by the British in 1794, and restored in 1802; it was again taken by the British in 1809, and restored a second time to France at the close of the war in 1814. Pop. returned for 1879, 164,250.

MARTINMAS, the feast of St. Martin of Tours, the 11th of November, one of the legal terms in Scotland. This feast was formerly celebrated with banquetings and carousals, where the hilarity was frequently excessive, whence came the old French expressions *martiner* and *faire la St. Martin* in the sense of 'to indulge in revelry and hard drinking;' and *mal de St. Martin* for an illness brought on by such living. The origin of this practice is attributed to the fact that St. Martin is regarded as the patron saint of drinkers, a position which he acquired, according to the legend, by being invited to a banquet by one of the Roman emperors, who offered him the goblet that he might drink out of it first, and that the emperor himself might receive it out of his hand. But the real origin of the feasting and revelry at this period is no doubt simply the fact that it is the time when the new wines of the year are drawn and when cattle are killed for winter food; and Martin has become the patron saint of drinkers because his festival happened to fall at this time. As this is the season also when fat geese are at their prime St. Martin's Day was often marked with a goose in the old almanacs, and it is still the custom in Germany to consume geese on this day under the name of Martinsganse (Martin's geese). In Scotland and the north of England a fat ox is called a *mart*, no doubt for a similar reason. The name Martinmas is frequently corrupted in England into *martlemas* or *martilmas*.

MARTIUS, Karl Friedrich Philipp von, a distinguished German traveller and naturalist, born at Erlangen in Bavaria in 1794; died at Munich, December 13, 1868. In his youth he studied chemistry and the natural sciences, and after receiving the degree of Doctor of Medicine in the university of his native town he joined Spix in the scientific expedition to Brazil planned and set on foot by the Austrian and Bavarian governments. During this expedition, which lasted from 1817 to 1820, Martius occupied himself chiefly with botany and ethnography, in addition to the statistics and geography of the regions which he visited. On his return to Bavaria he was appointed professor of botany and director of the botanic garden at Munich, appointments which he held till 1864, when he retired. He is the author of a large number of works chiefly connected with botanical science; but he is chiefly known through his journey to Brazil and the works in which he gave to the world its scientific and other results. Of these the most important are Reise nach Brasilien (Munich, three vols. 1824–31); Historia naturalis Palmarum (three vols. 1823–45, with 219 coloured plates); and Flora Brasiliensis (parts 1 to 54, Leipzig, 1840–71), the last two of which are magnificent works, and among the most remarkable that have ever been contributed to botanical literature.

MARTOS, a town in Spain, Andalusia, in the province of Jaen, and 10 miles W.S.W. of the town of Jaen. It contains a fine church built in the thirteenth century. At some distance from the town are two bathing establishments, the waters of which contain sulphur, magnesia, alum, &c. Linen, pottery ware, hats, and oil are made. The town became a Roman colony under Augustus. It was taken from the Moors in 1225 by Ferdinand III., who bestowed it on the order of Calatrava, the ancient castle of which order is still to be seen there. Pop 14,654.

MARTYR, Peter (more correctly Pietro Martire d'Anghiera), an Italian writer, born at Arona, a town on the Lago Maggiore opposite Anghiera, in 1455; died at Granada in 1526. In 1477 he entered the service of Cardinal, and in 1487 that of Ferdinand and Isabella of Spain. Ferdinand employed him in some important affairs, and created him counsellor of the Indies. Charles V. also treated him with favour. His principal works are De Rebus Oceanicis et Orbe Novo Decades octo—a history of the discoveries of Columbus and his successors, from their own relations; De Insulis nuper inventis (1521); De Legatione Babylonica—an account of his embassy to Egypt, whither Ferdinand had sent him in 1501; and his Opus Epistolarium.

MARTYR, Peter (Pietro Vermigli), one of the earliest Protestant divines, distinguished for learning and abilities, was born at Florence in the year 1500, and entered at the age of sixteen the order of the regular canons of St. Augustine, at the monastery of Fiesole. In 1519 he removed to Padua, where he studied Greek and philosophy. In 1526 he commenced to preach, and attracted great applause in several cities of Italy. After receiving numerous important offices in his order his religious opinions were considered as savouring too much of the doctrine of the reformers, and it became necessary for him to quit Italy, and at Zürich, in Switzerland, he was received in a friendly manner by the Protestant clergy (1542). Soon after he became professor of divinity at Strasburg, and in 1547 accompanied Bucer, Fagius, and other learned reformers, on the invitation of Archbishop Cranmer, to England. Martyr had followed the example of Luther in marrying a nun who had renounced her vows. He was appointed to the theological chair at Oxford in 1549, and became a very efficient assistant to the English reformed clergy in carrying on their plans of innovation in the church. On the accession of Queen Mary, being commanded to quit the country, he returned to Strasburg and resumed his former situation. In 1556 he removed to Zürich to occupy the office of theological professor. In 1561 he assisted at the famous conference between the Catholics and Protestants held at Poissy, in France; and died at Zürich in 1562. Peter Martyr was the author of many works on divinity, including commentaries on some parts of the Old and

MARTIN, St., the most famous of this name, was born of heathen parents at Sabaria, in Pannonia (now Stein, in Lower Hungary), about the year 316. He attended the catechetical school at Pavia. His father was a military tribune, and [illegible] him in the sixteenth year to take up [illegible] to have early escaped from his [illegible] instruction in a Christian chu[illegible] his life was marked with the ri[illegible] served under Constantius and [illegible] Gaul, where he appeared as the [illegible] Among other acts he divided h[illegible] man whom he met at the gates [illegible] name. The legend says that Chri[illegible] in the following night covered with [illegible] cloak. Soon after this vision Martin [illegible] After living many years in retire[illegible] visit to his native place, during which h[illegible]

MARTINA FRANCA, [illegible] of Italy, in the province [illegible] east of Taranto. Silkworms [illegible] bourhood, and there is a co[illegible] and cocoons. Pop. 18,[illegible]

MARTINIQUE, one of the [illegible]

mained. She sees the connection between the vision of angels which the shepherds related, and what she already knew: she was not astonished when she heard the prophetic blessing of Simeon. At the wedding in Cana she sought the miraculous power of her Son to relieve the embarrassment occasioned by a want of wine. She doubtless attended him through all his perilous course, with ever-watchful anxiety, for we find her absorbed in silent sorrow at his cross, with the beloved disciple John. To his care Jesus intrusted her as to a son, after which she disappears from history.

The first instances of adoration paid to the Virgin Mary are met with in the fourth century, and at that time those who paid such worship were condemned as heretics by the church. One of the chief ceremonies in use among those who adopted this worship was that of offering to the Virgin, on a carriage consecrated to her service, small cakes (Greek, *kollyris*), whence they were called *Collyridians*. Even orthodox theologians began to maintain the opinion that Mary always remained a virgin as a doctrine of faith; and a party in Arabia, which regarded her as the actual wife of Joseph and the mother of several children by him, was called *Antidikomarianites*, that is, the adversaries of Mary. At the end of the fourth century Helvidius in Palestine and Bishop Bonosus in Illyria were declared heretics for the avowal of similar opinions. The title of Mary to adoration did not become a tenet in the orthodox Latin Church till the sixth century. The sentiment of veneration for the Virgin which led to worship being paid to her most probably sprung up as a reaction against the teaching of Nestorius, who held that Jesus, the son of Mary, was begotten a mere man, and that the divine nature was afterwards added to him. When this doctrine was condemned by the Council of Ephesus in 431, which declared that the divine nature already existed in the son that was born to Mary at the time of his birth, that that son was from the first both God and man, Mary herself, as the mother of God, came to be held in greater regard, and in course of time the veneration that was felt for her in this relationship came to express itself in formal worship. In the sixth century the Christian church began to celebrate festivals in her honour, of which the Purification, the Annunciation, and the Visitation (the visit of Mary to Elizabeth) are still retained in many Protestant countries. The Greek and Catholic Christians, and the schismatic churches in the East, observe several feasts besides the above in honour of the Virgin; for instance, the birth of Mary, and her ascension to heaven; that is, her death and reception to heaven (by the Catholics called the *Assumption*). The festival of the immaculate conception is celebrated only by the Catholic Church. (See CONCEPTION, IMMACULATE.) The worship of Mary gave rise to a belief in the miraculous power of several old images of the Virgin. Those at Loretto, in Italy, and Chenstochov in Poland, are particularly celebrated for their healing powers, both in diseases of mind and body. To such images the Catholics have been accustomed to perform pilgrimages to obtain the indulgence promised to pilgrims by the Papal bulls. Several religious orders have been instituted in honour of the Virgin Mary, among which are the mendicant order of Servites, and all the orders of females called by her name; for example, the nuns of the Conception, of the Annunciation, of the Visitation. For the Catholic worship of the Virgin, so important in history and for its influence on the fine arts, see VIRGIN MARY and SAINTS.

Sacred history mentions several Maries:

1. MARY OF BETHANY, the sister of Lazarus, the ready scholar and tender worshipper of Jesus, to whom he vouchsafed his peculiar friendship and an imperishable name (Mat. xxvi. 13).

2. MARY OF MAGDALA, or MARY MAGDALENE, who was cured by Christ of an inveterate disease, and proved her gratitude by the most devoted adherence to him. She served him with her property, attended him on his journeys, and wept at his crucifixion. She was the last to leave his grave, and the first to visit it on the morning of the resurrection, and to behold her risen Lord. See MAGDALENE.

3. MARY, the sister of the Virgin Mary, supposed by some to be the same with Mary the wife of Clopas (not Cleophas, as in John xix. 25) or Alphæus (another Greek form of the same Aramaic name), and the mother of the apostle James the Less.

MARY I., Queen of England, daughter of Henry VIII. by Catharine of Arragon, was born in 1516. In her infancy she was betrothed first to the Dauphin of France, afterwards to the Emperor Charles V., and lastly to the Duke of Orleans. After her mother's death she was declared illegitimate, but was restored to her rights when the succession was finally settled in 1544. She was bred up by her mother in a zealous adherence to the Roman Catholic faith, on which account she was treated with rigour under Edward VI. She ascended the throne in 1553, after an abortive attempt to set her aside in favour of Lady Jane Grey. One of her first measures was the reinstatement of the prelates who had been superseded in the late reign, while Cranmer was prosecuted for high treason, and several other Protestant bishops imprisoned. The marriage of the queen with the Archduke Philip, son of the Emperor Charles V., afterwards Philip II., united as it was with a complete restoration of the Catholic worship, produced much discontent. Insurrections broke out under Cave in Devonshire, and Wyat in Kent, which, although suppressed, formed sufficient excuses for immuring her sister the Princess Elizabeth in the Tower, and dooming the youthful and unfortunate Jane Grey and her husband Lord Guildford Dudley, who had been hitherto spared, to execution. The endeavours of Mary to obtain a recognition of her husband's authority in England were unsuccessful. She succeeded better in a reconciliation of the kingdom to the pope, which was effected in great form by the legate Cardinal Pole. The sanguinary laws against heretics were revived, and those shocking scenes of cruelty followed which have fixed upon this princess the hateful epithet of *bloody* Queen Mary. The legate Pole disapproved of this severity, but the arguments of Gardiner and others were more congenial to the gloomy bigotry of the sovereign, and according to one account 277, according to another, 288, persons were committed to the flames, including prelates, private clergymen, laymen of all ranks, women, and even children. Her union with Philip II. was equally unpropitious to herself and the nation. Eleven years younger than the queen he treated her with great neglect, and to prevent the fulfilment of his threat of desertion England was forced into a war with France, and the assistance of English troops facilitated the Spanish victory over the French at St. Quentin. This result, which was of no service to England, was quickly counterbalanced at her expense by the loss of Calais, which was taken in 1558, after it had been in the hands of the English for above 200 years. This disgrace sank deep in the heart of Mary, who was already declining from a dropsical complaint, and preyed upon by a consciousness of the hatred of her subjects and the indifference or aversion of her husband. She terminated her short and dark reign of little more than five years in November, 1558, in the forty-second year of her age. Mary was not destitute of the characteristic vigour and ability of

her family, but her natural capacity was clouded by bigotry and the prejudices fostered by the connection of her mother's divorce and ill-treatment with the separation from the see of Rome. Hateful as was the severity really displayed, it has not unfrequently been highly exaggerated, and censured with too little regard to the intolerance prevalent in that age. With Mary I. ended the dominion of popery in Great Britain.

MARY II., Queen of England, born in 1662, was the daughter of James, Duke of York, afterwards James II., by his wife Anne Hyde, daughter of Lord Clarendon. She was married in 1677 to William, prince of Orange, and when the revolution was effected which dethroned her father, Mary was declared joint-possessor of the throne with her husband King William, on whom all the administration of the government devolved. During the absence of William in Ireland in 1690 Mary managed parties at home with extreme prudence, and acted with equal ability during his various visits to the Continent. She was strongly attached to the Protestant religion and the Church of England. Mary died of the small-pox at Kensington at the end of 1694. See WILLIAM III.

MARY HALL, ST., one of the halls of Oxford University, originally the parsonage-house of the rectors of St. Mary's Church, but given with all its appurtenances to Oriel College by Edward II. in 1325. In 1333 it was converted into a separate place of education, and afterwards became an independent academical hall. There are four Dyke scholarships, each at present of the value of about £50 per annum (but with a prospect of gradual increase to £75 per annum), and tenable for four years; and one exhibition, called the Nowell exhibition, of the annual value of £30, and also tenable for four years.

MARYLAND, one of the maritime United States, America; bounded N. by Pennsylvania, E. by Delaware and the Atlantic, S. by Virginia and Chesapeake Bay, which latter, extending 270 miles northwards with a varying breadth, divides the state almost completely into two parts; and W. by Virginia and West Virginia. It is of very irregular shape; its area is 12,210 square miles. The part of the state lying to the east of Chesapeake Bay is called the Eastern shore, and the other on the west the Western shore. The Eastern shore has a low, flat, and somewhat sandy surface, covered in many places with stagnant water, which makes ague and intermittent fever prevalent. The Western shore, below the falls of the rivers, has much the same appearance as the Eastern, but gradually rises towards the north-west, where it is traversed by a lower branch of the Appalachian chain, and attains the height of 2000 feet above sea-level. Beyond this the land again sinks, forming what is called the Hagerstown Valley, part of the great Appalachian Valley. By far the most important river is the Potomac, which separates Maryland from Virginia nearly throughout its whole length, and is navigable for the largest vessels to Washington. The Susquehanna is also a large river, but only a small portion of its lower course, before it falls into the north extremity of Chesapeake Bay, belongs to Maryland. The Patapsco is navigable for larger vessels as far as Baltimore. Almost all the lower part of Maryland is covered with alluvial deposits. In the Hagerstown Valley there is a full development of the carboniferous system, with its valuable seams of coal and ores of iron. There are three important coal-fields in the state. Two of them, with an estimated aggregate area of 370 square miles, being situated in a densely wooded country, have not been opened up; but the third, called the Frostburg or Cumberland Basin, occupying an area 20 miles long by more than 4 miles wide, has been examined with care, ascertained to be of excellent quality, and worked to some extent, chiefly for the supply of ocean steamers. Much of the low land of Maryland contains a considerable mixture of sand, but is well adapted for agriculture, and generally under good cultivation. The most important crops are Indian corn, wheat, and oats. Next to these, but in much smaller quantities are potatoes, ordinary and sweet, rye and buckwheat. Tobacco is grown to the extent of about 30,000,000 lbs. annually; the meadows yield heavy crops of hay, and great numbers of live-stock are reared, particularly cows for the dairy, sheep, and swine. The fisheries are productive, and there are extensive oyster-beds which yield about 8,000,000 bushels annually for export, in addition to those consumed in the state. The principal manufactures are cotton goods, cordage, bricks, and articles in iron; the trade, chiefly foreign, is extensive. A large part of the foreign trade consists in the exportation of fruits, vegetables, and oysters, preserved and made up in hermetically sealed cases. The length of railways within the state at the end of 1882 was 1063 miles.

The state is divided into three districts—East, South, and North-west; and by the constitution the people of each district have the privilege, alternately, of electing the governor, who is chosen for four years. The Senate consists of twenty-six members, elected by the people for four years; and the house of representatives of ninety-one members, elected for two years. The state sends six representatives and two senators to the Congress of the United States. Annapolis is the seat of government; other principal towns are Baltimore (the most important city of the state, with respect to population the seventh city of the United States), Frederick, and Hagerstown. There is an excellent system of free public schools, supported by state, county, and municipal taxation; the schools in 1881 numbering over 2000, with nearly 160,000 pupils, conducted at a total expense of £320,916. The higher educational institutions comprise St. John's College at Annapolis, the normal school at Baltimore, the Western Maryland, Maryland Agricultural, Baltimore Female, Washington, and Frederick Colleges, all partly supported by the state. In addition there are the Peabody Institute (founded in 1857), and the Johns Hopkins University (opened in 1876), both at Baltimore.

Maryland received its name from Henrietta Maria, queen of Charles I., by whom this district was granted in 1632 to Sir George Calvert, Lord Baltimore, a Roman Catholic and an eminent statesman who had been secretary to James I. Before the patent was completed Lord Baltimore died, and the patent, dated June 20, 1632, was given to his eldest son Cecilius, who succeeded to his titles, and who for upwards of forty years directed, as proprietor, the affairs of the colony. Leonard Calvert, brother of Cecilius, Lord Baltimore, was appointed the first governor; and he, together with about 200 persons, commenced the settlement of the town of St. Mary's in 1634. A free toleration of religions was established, and a system of equity and humanity was practised with regard to the Indian tribes. After the colony of Maryland had established its general assembly, even to the time of the revolution which seated William and Mary on the English throne, the right of appointing the governor, and of approving or disapproving the acts of the assembly, was retained by the family of Lord Baltimore. The constitution of Maryland was formed in 1776, but many amendments were afterwards made, and in 1851 the constitution was remodelled; important constitutional amendments have since been adopted in 1864 and 1867. Pop. in 1870, 780,894; in 1880, 934,943.

MARYPORT, a market-town and seaport in England, in the county of Cumberland, 28 miles west of Carlisle, at the mouth of the Ellen, and at the west terminus of the Maryport and Carlisle Railway. The industries include iron-founding, brewing, tanning, flour-milling, and sail-making. The herring-fishery is productive, and considerable quantities of trout are taken in the river. There are several collieries in the neighbourhood, and also iron-furnaces. The construction of a new dock (commenced in 1880) is now all but completed. Pop. in 1881, 9827.

MARY STUART, Queen of Scots, was born at Linlithgow Palace, on the 7th or 8th of December, 1542, and was the daughter of James V., by his queen, Mary of Lorraine, a princess of the family of Guise. Her father dying when she was a few days old, disputes arose among the nobility about the guardianship of the infant sovereign, and the conduct of public affairs. The regency was at length vested in the Earl of Arran, and Henry VIII. of England having demanded the hand of Mary in marriage for his son Edward, the regent's ultimate rejection of the proposal occasioned a war, in which the Scots were defeated at the battle of Pinkie, near Musselburgh (1547). But the victory of the English had no effect in furthering the object of the war. In the summer of 1548 the young queen was sent by her mother to France, and within two years of that date peace was concluded between Scotland and England. The Scottish princess was educated in a French convent, and appears to have been instructed in every branch of learning and polite accomplishment which was fashionable at that period. On the 24th of April, 1558, she was married to the dauphin, afterwards Francis II. He died seventeen months after his accession to the crown, in December, 1560, and in August, 1561, the widowed queen returned to Scotland. Mary had, of course, been educated in France as a Roman Catholic, and her instructors had succeeded in inspiring her with a sincere attachment for the Roman Catholic faith. It was thus inevitable in that age, in which all sovereigns claimed the right of enforcing their own creed on their subjects, that she should desire not only to have liberty for herself to practise her own religion, but also to have her subjects follow that religion too. But unfortunately for her the Reformation had taken place in Scotland during her absence, and when she returned she found that the influence of the Presbyterians was paramount in her kingdom. In these circumstances she had sufficient discernment to see that it was vain for her in the beginning of her reign to make any open attempt to have Roman Catholicism again set up in Scotland. Within a few days after her arrival in Scotland she had an interview with John Knox, in the hope that by her arguments, and still more by the fascinations of her person and manner, which were usually unfailing in their effect, she might gain him over, at least so far as to take a more tolerant view of her own adherence to the Roman Catholic ritual, which Knox had the hardihood openly to condemn in the pulpit. In this interview it is evident, from Knox's own account of it, she displayed consummate tact, but was unable to extort the slightest concession from the inflexible reformer. Seeing this she resigned herself to circumstances, and quietly allowed her half-brother, Lord James, whom she created first Earl of Mar, and then Earl of Murray, to assume the position of first minister, surrounded herself with a number of other Protestant advisers, and dismissed the greater part of the train of French courtiers who accompanied her to Scotland. She even gave these ministers her active support in various measures that had the effect of strengthening the Presbyterian party; but she still continued to have the mass performed in her own private chapel at Holyrood, and that without injuring the popularity which her fine person and queenly manners acquired among the greater number of her subjects in all parts of her dominions. This early part of Mary's reign presents a great contrast with the remaining part of it, and indeed with the remainder of her whole life. Her subjects were quiet, she herself was popular, and her court was one of the most brilliant in Europe. The calamities of Mary began with her second marriage. Almost from the time of her arrival in Scotland numerous suggestions had been made for the disposal of her hand. At this period Mary was ambitious of contracting a marriage which should add to her dignity and power, and accordingly the only one of the proposals that were made upon which she looked with any favour, was that for her marriage with Don Carlos, son of Philip II., and heir to the extensive dominions of Spain. Negotiations for accomplishing this match were secretly carried on by her for many months, but were suddenly put a stop to in February, 1565, when she saw for the first time at Wemyss Castle her cousin, Lord Darnley, son of the Earl of Lennox. The queen's heart was at once captivated. Lord Darnley had numerous favours conferred upon him; was made in a short time Lord of Ardmanach, Earl of Ross, and Duke of Albany. On the 15th of May, 1565, Queen Mary announced to an assembly of her feudal lords her intention of marrying him, and on the 29th of July following the marriage was actually consummated. The marriage was in every respect an unfortunate one. Darnley was a Roman Catholic, and from the time when he attracted the queen's eye her old advisers lost favour, and her design of subduing the spirit of the Presbyterians now became apparent. Immediately after the marriage the Earl of Murray, Glencairn, Rothes, Kirkcaldy, and others of the Protestant lords combined against the new order of things; and although their attempt at rebellion was easily thwarted, and the rebels themselves compelled to take refuge in England, the popularity of Mary began to decline. In addition to this Darnley proved a profligate and ungrateful husband, and a weak and worthless man. Within a year after the marriage the numerous indignities which he offered to the queen were crowned by his putting himself at the head of the band of conspirators, who had united for the purpose of murdering David Rizzio, an Italian, who, having found his way to the queen's court in the train of some foreign ambassador, had gained her favour by his skill in music and various other accomplishments, and had thus excited the envy and hatred of the Scotch nobility who were less highly favoured. Darnley had been worked upon to believe that he had cause to be jealous as a husband of Rizzio, and was thus induced to join the conspiracy. The plan of the conspirators was carried out in the most heartless manner, Rizzio being forcibly removed by the assassins from the queen's presence while he was supping with her and the Duchess of Argyle, and murdered within a short distance of the queen, although not actually in her presence (March 9, 1566). In consequence of this act of violence the breach between Darnley and the queen became wider than ever. Mary indeed professed to believe Darnley's declaration of his own innocence of any connection with the affair, but her hatred of him could not be concealed. A little more harmony prevailed between the two for a short time after the birth of their son, afterwards James VI. of Scotland and I. of England, which took place on the 19th of June, 1566; but about the close of the same year Darnley with-

drew from the court, assuring the queen that she should not see his face for a long space. Meanwhile the Earl of Bothwell had risen high in the queen's favour. The first step had been made on the occasion of the rebellion of the Protestant lords consequent on the queen's marriage with Darnley, when Bothwell came over from the Continent, and offered his services in putting down the rebels. From that time Bothwell had always occupied a place of great influence at the court, and by the time that the rupture between Darnley and the queen had reached its widest, the courtiers had observed in the latter signs of a warmer attachment to Bothwell than would naturally be shown to one who was no more than a faithful servant. When the young prince James was baptized at Stirling Castle, on the 7th of December, 1566, Bothwell did the honours of the occasion, and Darnley, the father of the prince, was not even present. Once more, however, an apparent reconciliation took place between the king and queen. Darnley had fallen ill, and was lying at Glasgow under the care of his father, the Earl of Lennox, when Mary announced her intention of visiting him. On reaching Glasgow she persuaded her husband to allow himself to be removed to Craigmillar Castle, near Edinburgh, as soon as he was able to bear the journey; but instead of this he was taken to Edinburgh, and lodged in a house called Kirk-of-Field, close to the city wall. It was on the last day of January, 1567, that Darnley was lodged in Kirk-of-Field, and from that day till the 9th of February following he was tended there by the queen herself, who slept in a chamber beneath Darnley's. On the evening of the day last mentioned Mary left her husband to be present at a masque at Holyrood, in honour of the marriage of a favourite page, and during the following night the house in which Darnley lay was blown up by gunpowder, and he himself was afterwards found dead with marks of violence on his person. The circumstances attending this crime were very imperfectly investigated, and although popular suspicion unequivocally pointed to Bothwell as the ringleader in the outrage, he still continued in favour and power at the court. A kind of trial took place in accordance with the instructions of the privy-council, on the 12th of April; but instead of the formal prosecution in name of the crown that was usual in criminal trials, there was nothing more than an accusation of Bothwell laid before the jury by one of the gentlemen of the household of the Earl of Lennox, father of the murdered person, unsupported by any evidence, so that the jury was compelled to acquit the accused. On the 19th of the same month some of the most influential members of Parliament met at a great supper, and signed a document recommending the queen's marriage with Bothwell as a proper step to be taken for the public good. The event here foreshadowed very soon after actually took place. On the 21st the queen went to Stirling to visit her son the infant prince, and on her return she was intercepted by Bothwell at the head of a body of armed men, and carried off with but little resistance, or show of resistance, to his Castle of Dunbar. A divorce between Bothwell and his wife, whom he had married only the year before, was now procured, and Mary's intention of marrying him was publicly announced. The completeness of the ascendency that Bothwell had now acquired over the queen, is evident from the fact that he was able to insist on having the marriage ceremony performed not in the manner required by the queen's religion, but in that of his own, which was Protestant. The banns of marriage were regularly proclaimed by John Knox's assistant, and the ceremony was performed on the 15th of May. Very few were present at the marriage, and after the marriage Holyrood continued to be ominously deserted. On the first occasion on which Mary saw fit to make a proclamation to her subjects she found that she had lost their allegiance; for when on the 28th of May she summoned the feudal forces together for an attack on the border marauders, the summons remained unobeyed. Alarmed at this Bothwell and Mary suddenly fled from Holyrood to Borthwick Castle, about 13 miles from Edinburgh, and when they saw themselves surrounded here by a hostile force managed to make their escape to Dunbar. In a few days Bothwell succeeded in collecting a force numerous enough to warrant him in meeting that of the nobles that had confederated themselves against him; but on Carberry Hill, about 7 miles from Edinburgh, where the armies met on the 15th of June, his army melted away. The queen was forced to surrender herself to her insurgent nobles, and Bothwell took refuge in flight. He first made his escape to Dunbar, then to the Orkney Islands, and finally to Denmark, where he died in 1576. The confederates first conveyed the queen to Edinburgh, where in passing through the city to the provost's house, the place to which she was first taken, she was exposed to the insults and contempt of the populace. From Edinburgh she was removed to Loch Leven Castle, where she was placed in confinement, in the custody of Lady Douglas, mother of the Earl of Murray. A few days after these events, on the 20th of June, a casket containing eight letters and some poetry, all said to be in the handwriting of the queen, fell into the hands of the confederates. The originals of these papers are now lost, but their contents have come down to us in the form of a translation appended to Buchanan's Detection. These letters breathe the most passionate devotion to the person to whom they are addressed, and if they are genuine, and have not been tampered with in the form in which we know them, clearly show that the writer was herself party to the murder of Darnley. This is the famous casket which has been the cause of endless discussion among the modern partisans and accusers of Mary. Whatever doubt may attach to the letters in our day, certain it is that their discovery at this critical time was held by the confederates to afford unmistakable evidence of the queen's guilt, and there was therefore no longer any thought of releasing her. On the 24th of July she was forced to sign a document renouncing the crown of Scotland in favour of her infant son, and appointing the Earl of Murray regent during her son's minority. At this time Murray was abroad, but he instantly returned to Scotland, and was inaugurated as regent on the 22d of August. After remaining nearly a year in captivity Mary succeeded, with the help of George Douglas, the younger son of Lady Douglas, and one Willy Douglas, often called "the little Douglas," in making her escape from Loch Leven (May 2, 1568), and assisted by the few friends who still remained attached to her she made an effort for the recovery of her power. The battle of Langside (May 13, 1568) insured the triumph of her enemies, and to avoid falling again into their power she fled to England. She landed at Workington, in Cumberland, on the 16th of May, and the 17th is the date of a long letter which she wrote to Elizabeth, in which, after giving a long account of her distresses, she entreats the protection of her rival. In subsequent letters she earnestly sought for a personal interview with Elizabeth; but this the latter distinctly refused to grant, until Mary should have cleared herself from the charges laid against her by her subjects, especially that of being concerned in the murder of her husband. Mary all along denied the right either of a Scotch or an Eng-

lish court to sit in judgment upon her; but at last consented that her cause should be discussed by certain commissioners, one set of whom was to be appointed by herself, one set by the confederates who governed in Scotland, and the third set by the English government. Elizabeth for her part made promise, upon certain conditions, to set up Queen Mary again as queen in Scotland, provided this conference turned out satisfactorily. The commissioners met first at York, but the conference was afterwards transferred to Hampton Court. In the course of the discussions the commissioners representing the Scottish nobles plainly accused Queen Mary of participation in the murder of Darnley, and supported their accusation by the casket letters among other documents. Elizabeth then pressed Mary to reply to this charge; but Mary not only declined to do this, but directed her commissioners to withdraw from the conference. Elizabeth consequently persisted in her refusal to see her. The conference lingered on for some time longer, but came to no definite conclusion. The final result was that all the parties concerned remained in the same condition as before. Murray continued to be regent in Scotland in place of the infant King James VI.; Mary remained in captivity in England. The rest of her life was passed in a succession of intrigues for accomplishing her deliverance, and sometimes for greater objects. The first of these intrigues was begun when the conference was still going on. The leader in it was the Duke of Norfolk, the chief of the commissioners first appointed by Elizabeth, who was flattered with the hope of obtaining Mary's hand. The plot having been detected Norfolk was committed to the Tower. On being released in the following year (1570) he renewed his correspondence with Mary; but was apprehended a second time, convicted of treason, and beheaded (June 2, 1572). For more than eighteen years Mary continued to be the prisoner of Elizabeth, and in that time the place of her imprisonment was frequently changed. She was at last accused of being implicated in Babington's plot against Elizabeth's life and government, and having been tried by a court of Elizabeth's appointing, was on the 25th of October, 1586, condemned to be executed. There was a long delay before Elizabeth signed the warrant for the sentence to be carried out, a delay attributed by different writers to different motives, but this was at last done on the 1st of February, 1587. Mary received the news of her destined fate with great serenity; wrote her will; and having prepared herself for death, by practising the ceremonies enjoined by the Catholic faith, to which she was devotedly attached, suffered decapitation, February 8, 1587, in the castle of Fotheringay, where she had been long confined; and, August 1, was interred with great pomp in the Cathedral of Peterborough. Her body was subsequently removed by her son, James I., to Henry VII.'s chapel, Westminster, where a magnificent monument was erected to her memory. The character and conduct of Mary, queen of Scots, have been made the subject of much controversy. 'No inquiry,' says Sir Walter Scott in his History of Scotland, 'has been able to bring us to that clear opinion upon the guilt of Mary which is expressed by many authors, or to guide us to that triumphant conclusion in favour of her innocence of all accession, direct or tacit, to the death of her husband, which others have maintained with the same obstinacy. The great error of marrying Bothwell, stained as he was by universal suspicion of Darnley's murder, is a spot upon her character for which we in vain seek an apology. What excuse she is to derive from the brutal ingratitude of Darnley; what from the perfidy and cruelty of the fiercest set of nobles who existed in any age; what from the manners of a time in which assassination was often esteemed a virtue, and revenge the discharge of a debt of honour, must be left to the charity of the reader.' The works which have either been expressly written on the subject, or which contain matter relating to it, are almost innumerable. They are mostly written in English or French, and have been constantly appearing from the date of the events under discussion down to the present day. Among the more celebrated of the earlier works connected with this controversy are Buchanan's Detectio Mariæ Reginæ Scotorum, which afterwards appeared in a vernacular translation, under the title Ane Detection of the Duinges of Marie Quene of Scottes, touchand the murder of hir husband and her conspiracie, adulterie, and pretended marriage with the Erle Bothwell; L'innocence de la très-illustre, très-chaste, et debonnaire princesse Marie, reyne d'Escosse, by Belleforest (1572); Martyre de la reyne d'Escosse dovarière de France contenant le vray discours des traisons à elle faictes d'Elizabet, angloise, par lequel les mensonges, calomnies et faulses accusations dressées contre ceste tresuertueuse tres catholique et tresillustre princesse sont ecclaircies et son innocence averée, by Adam Blackwood (Edin. 1587); Barnestaple's Maria Stuarta, regina Scotiæ, dotaria Franciæ, hæres Angliæ et Hyberniæ, martyr ecclesiæ, &c. (Ingolstadt, 1588); and the Summarium rationum, quibus cancellarius Angliæ et prolocutor Puckeringius Elisabethæ Angliæ reginæ persuaserunt occidendam esse . . . Mariam Stuartam Scotiæ reginam . . . una cum succinctis quibusdam animadversionibus et confutationibus eorum, quæ ei objecta sunt, by Romoaldus Scotus (1588). The most important of the earlier works of this controversy are collected in Jebb's De Vita et Rebus gestis Mariæ Scotorum Reginæ, quæ scriptis tradidere authores XVI., ad optimæ fidei codices recensita (Lond. 1725). Valuable information is also to be found in James Anderson's Collections, relating to the History of Mary, Queen of Scotland (Edin. 1727–28). Among the subsequent works relating in whole or in part to the same controversy, are Walter Goodal's or Goodall's Examination of the Letters said to be written by Mary, Queen of Scots, to James, Earl of Bothwell (Edin. 1754); Hume's History of England; Robertson's History of Scotland; W. Tytler's Inquiry into the Evidence against Mary, Queen of Scots (Edin. 1759); a dissertation by Malcolm Laing, on the Participation of Mary, Queen of Scots, in the Murder of Darnley, first prefixed to the edition of 1804 of that author's History of Scotland; P. F. Tytler's History of Scotland; Lettres, instructions, et mémoires de Marie Stuart, reine d'Écosse, edited by the Russian Prince Alex. Labanoff, and published in London in 1844–45; Agnes Strickland's Lives of the Queens of Scotland (Edin. 1850–59); Dargaud's Histoire de Marie Stuart (Paris, 1850); Mignet's Histoire de Marie Stuart (Paris, 1851); Cheruel's Marie Stuart et Catherine de Médicis (Paris, 1858); Lettres de Marie Stuart, publiées avec sommaires, traductions, notes et fac-simile par A. Teulet (Paris, 1859); Marie Stuart et le comte de Bothwell, by Wilsener (Paris, 1863); Burton's History of Scotland; Hosack's Mary, Queen of Scots, and her Accusers (Edin. 1869); History of Mary Stuart, Queen of Scots, translated from the original and unpublished manuscript of Prof. Petit (1873); and The Letter Books of Sir Amias Poulet, Keeper of Mary, Queen of Scots (1874).

Authorities are more agreed as to the attractions, talents, and accomplishments of Mary Stuart than as to her character. Contemporary writers who saw her unite in testifying to the beauty of her person, and the fascination of her manners and address. The great influence which she could exert over most

of those persons, whether men or women, with whom she came into direct contact, was manifested to the very end of her career. Her intellect was keen and quick. She was witty in conversation, and ready in dispute. In her trial for alleged complicity in Babington's plot she held her ground against the ablest statesmen and lawyers of England. Her letters and other prose works collected in the work of Labanoff give ample evidence of her skill in diplomacy, her gifts of style, and powers of sarcasm. Besides these prose works Mary was the author of some short poems of no great merit. The best is one on the death of her first husband Francis II., printed by Brantôme. She also wrote in French a volume of verse on the Institution of a Prince, but this is now lost. The lines beginning 'Adieu, plaisant pays de France,' long ascribed to her, have now been proved to have been written by a French journalist of the eighteenth century, A. G. Meusnier de Querlon. The most authentic portraits of Mary, besides the busts on the coins of the period, are an engraving by Cock of Antwerp, in 1559, in her seventeenth year; portraits by Francis Clouet, called Jehannet or Janet; and the recumbent statue by an unknown sculptor on her tomb at Westminster. The misfortunes of Mary have furnished a subject for the tragic muse of Schiller, Alfieri, and others. Mary also appears as a character in Swinburne's tragedies of Chastelard and Bothwell.

MASACCIO (properly TOMMASO GUIDI), one of the oldest painters of the Florentine school, to whom the art of painting owes very much, is said to have been born about 1402, at San Giovanni, in the Val d'Arno. In the church del Carmine, at Florence, are some excellent paintings of his, also at St. Clemente in Rome, but in a bad state. Baldinucci has described his life accurately, and corrected Vasari. Both place Masaccio among the first painters, by whom the harshness and difficulty of the art was diminished, and life and expression given to it. Annibal Caro composed an epitaph for him, in which he says Buonarotti taught all other painters, and learned from Masaccio alone.

MASANIELLO (properly TOMMASO ANIELLO), the celebrated Neapolitan insurgent, was born at Amalfi in 1622, and gained a livelihood in Naples as a fisherman and a dealer in fish and fruit. Although very poor, he had a proud and enterprising spirit. His love of freedom, and the boldness with which he expressed himself respecting the oppression which the Kingdom of Naples had long endured from Spain, procured him a large faction among the common people, who admired his boldness. As he was destitute neither of eloquence nor courage, nothing but opportunity was wanting for him to appear as the head of the populace. Such an opportunity offered in 1647. Masaniello had brought a basket of fruit to the city, for which the collectors demanded the tax. He refused, and they using force, he threw himself on the earth, and implored the people to aid him against their violence. An insurgent multitude immediately assembled, at the head of which he advanced to the tax-office, with the cry, 'Long live the king, but down with the bad government.' Thence the insurgents repaired to the castle of the viceroy, the Duke of Arcos, and demanded that he should receive Masaniello as a colleague. In vain did the Cardinal Filomarino, archbishop of Naples, seek to appease their fury; in vain did John of Austria, a natural son of Philip IV., appear in the harbour with twenty-two galleys; the insurrection only increased the more, and the nobility became the object of its rage. Palaces were destroyed; all those who during many years had enriched themselves at the expense of the people—tax-collectors, monopolists, bakers who used false weights, were put to death at the command of Masaniello. The viceroy was forced to make concessions: he was obliged to agree to a formal treaty in which the taxes on fruit were abolished, and the ancient liberties said to have been granted by Charles V. restored. The viceroy gave his assent to this treaty in great state in the church of the Carmelites on the 13th of July, and that of the King of Spain was promised within a certain time. Masaniello, on this assurance, laid down his arms, and returned, without demanding any recompense or distinction, to his former station. But the great party which he still possessed making him appear dangerous to the viceroy, who was no ways disposed to fulfil his promises, this ruler resolved to get rid of him. He invited Masaniello to his own house, and probably mingled poison with his wine. This did not indeed kill him, but made him delirious, to which his passion for heating liquors may also have contributed. In this state the unfortunate man ran through the streets of Naples, shooting his best friends, and committing the greatest excesses. On the 16th of July, only three days after the conclusion of the treaty with the viceroy, he was accordingly assassinated by some of his companions in the rising. But the next day Masaniello's murderers became victims to the popular rage; his body was buried with the highest marks of respect, and even for some time held as sacred. These events have been used by Auber as the subject of an opera called La Muette de Portici, or more usually Masaniello.

MASAYA, a town in Central America, in Nicaragua, 12 miles north-west of Granada. It stands in the centre of a very fertile district, and the inhabitants, chiefly Indians, are distinguished for their general industry and the manufacture of hats, saddles, hammocks, cordage, &c. In the vicinity is a lake of same name, from the north-west border of which the volcanic mountain of Masaya rises to the height of 3500 feet. As its last eruption took place in 1670, it was supposed to be extinct; but it has again shown signs of activity, and in 1860 sent out great volumes of smoke, which at night were illuminated from below with a lurid glare like a furnace. Pop. 15,000.

MASCARA, a town in Algeria, picturesquely situated on the south slope of Mount Atlas, 48 miles south-east of Oran. It was used as a military depot by Abd-el-Kader, and was taken by the French in 1835 and 1841. A strong garrison has since been maintained in it. Pop. 9240.

MASCARENE ISLANDS, or the MASCARENHAS, the islands of Bourbon, Mauritius, and Rodriguez, so called from Mascarenhas, a Portuguese navigator, who discovered Bourbon in 1545.

MASINISSA, King of the Numidians, the son of Gala, king of the Massylians, the easternmost of the two great tribes into which the Numidians were then divided. While yet young he defeated Syphax, king of the Massæsylians (Western Numidians), an ally of the Romans. He then served in the Carthaginian armies in Spain against the Romans. Fortune at first favoured his enterprises; but having been totally defeated by Scipio Africanus at Bætula, with Hasdrubal and Mago, he capitulated, and became an ally of the Romans. In the meantime his father died, and Mezetulus, an enemy to his family, usurped the dominion under the name of a guardian. When Masinissa was informed of this he hastened back to Africa, and reconquered his paternal kingdom. During this period the enmity between Syphax and Carthage had ceased, and Hasdrubal had given to Syphax his daughter Sophonisba, who had already been betrothed to Masinissa, which was one of the circumstances which induced him to desert the Carthaginians and join the Romans. Syphax, at the

instigation of Hasdrubal, attacked Masinissa with such success as to compel him to flee with only a few horsemen. He then conquered the country of the Massylians, and Bochar, one of his generals, pursued Masinissa so closely that he escaped with only a few attendants and severely wounded. They concealed themselves in a cave, and supported themselves by plunder, till Masinissa recovered from his wounds. He then hastened to the frontiers of Massylia, and, aided by the inhabitants, not only recovered his patrimony, but invaded Massæsylia itself. Syphax, however, again defeated him, and he escaped to the Syrtis Minor with only seventy horsemen. He awaited there the arrival of his allies the Romans. Syphax was now persuaded by the Carthaginians to restore Masinissa his kingdom, for they hoped to gain him thus to their interests, but they were disappointed. The junction of his Numidian cavalry with Hasdrubal was only to save appearances; he kept up a secret connection with Scipio, and acquainted him with all the plans of the enemy, and at last openly went over to him. He now had it in his power to take vengeance on Syphax. With the assistance of the Romans he defeated him several times, pursued him into his own territories, and finally made him prisoner with his son. By the capture of the metropolis the conquest was completed, and Sophonisba now fell into his power. Although he had resolved to punish her infidelity, his early love was revived, when, throwing herself at his feet, she begged for death as the only deliverance from the shame of Roman bondage. He took her for his wife, expecting thus to evade the claims of the Romans; but Scipio demanded her as the prisoner of the Romans. The unhappy prince, who was entirely in their power, found that nothing but death could deliver her from their hands. He therefore sent her a poisoned chalice, which she willingly drank off, declaring that she died with pleasure, since it was by his command, and that he was the first and only object of her love. Scipio strove to soothe the grief of Masinissa by the highest marks of honour. He conferred on him the title of king in the presence of the army, granted him a crown of gold, a curule chair, &c., and procured from the senate the confirmation of his regal dignity. Masinissa continued in the Roman army, and gained fresh laurels in the battle of Zama against Hannibal, where he commanded the cavalry of the right wing. At the conclusion of peace with Carthage he recovered not only all his former possessions, but also the greater part of the territories of Syphax. His hatred against Carthage remained unabated, and he took from this republic a number of provinces, which the Romans confirmed to him. This led to an open rupture between Masinissa and Carthage, and this in turn led to the third Punic war, in the second year of which Masinissa died (148 B.C.) When Masinissa felt death approaching he sent for the young Scipio Æmilianus, and gave him full power to take any measures in regard to his kingdom which he thought would be most conducive to the good of his three surviving legitimate sons, Micipsa, Mastanabal, and Gulussa, among whom he desired his dominions to be partitioned. He died at the age of ninety years, and left behind him the name of a valiant and enlightened prince. He introduced a higher degree of civilization among his subjects, and taught them the advantages of agriculture.

MASK, a covering for the face, often shaped so as to form a rude representation of the human features. They have been in use from the most ancient times. Among the Greeks they were used, particularly in the processions and ceremonies attending the orgies of Dionysus. As the origin of Grecian tragedy was closely connected with the worship of Bacchus, masks were used in it even in the beginning. Who first introduced them into comedy is unknown. Some ancient masks seem to have been, like the modern ones, merely coverings for the face, but it was more usual for them to cover the whole head, and represent, with the features, the head, hair, and eyes. They were at first made of the bark of trees, then of leather, afterwards of wood, which the artist fashioned according to the design of the poet. The comic masks were distinguished by a grotesque laughing countenance; the tragic ones had more dignity, but were sometimes frightful. There were also satyr masks and orchestric, or those with regular features, for dancers. They had mostly very large open mouths, within which were metallic bars or other sounding bodies to strengthen the voice of the speaker—a contrivance which was required by the construction and immense size of the old theatres. Many critics (so called), ignorant of the peculiarities of the Grecian stage, are unsparing in their censures of the ancients for the introduction of masks into their plays, because, say they, all imitation of nature, and even the flexibility of voice necessary for the expression of passion, were thus rendered impracticable. They do not consider that, from the colossal size of the Grecian theatres, the minute imitation of nature in tone and countenance, which the moderns applaud, would have been lost. As the Roman theatre was in almost all its parts formed upon the Grecian, it differed little in the use of the mask. The work of Francesco de' Ficoroni upon the stage masks and comic personages of ancient Rome is instructive and highly interesting from the copperplate illustrations. The Italian popular theatre, called Commedia dell' Arte, which has a close resemblance to the old Roman mime and pantomime, still retains the use of the mask; for these drolleries of the old Roman stage, requiring no particular learning or high cultivation, continued even under the government of the barbarians.

The mask used at masked balls or masquerades is a covering for the head and face made from a light stuff, with which a man may disguise himself and remain unknown, or perhaps represent some other character. There are whole and half masks—for example, masks for the nose and the eyes.

MASK, a species of drama. See MASQUE.

MASK, THE IRON. See IRON MASK (THE MAN WITH THE).

MASKELYNE, NEVIL, an eminent mathematician and astronomer, born in London in 1732, educated at Westminster and Cambridge, was chosen a fellow of the Royal Society, and in 1761 deputed to proceed to the island of St. Helena to observe the transit of Venus. During the voyage he employed himself in making lunar observations with a view to ascertaining the longitude. In 1763 he went to Barbadoes to try the accuracy of Harrison's timekeeper. In February, 1765, he succeeded Bliss as astronomer royal; and in 1767 commenced the publication of the Nautical Almanac, for which he published a volume of accompanying tables. In 1774 Maskelyne was employed in making observations on the eclipses of Jupiter's satellites at Greenwich; and the same year he went to Scotland to ascertain the gravitative attraction of the mountain Schiehallien, in Perthshire, of which he published an account in the Philosophical Transactions. He died in 1811. He was the author of the British Mariner's Guide, containing instructions for the discovery of the longitude at sea and land (1763, 4to); and Astronomical Observations made at the Royal Observatory at Greenwich (1784–88, three vols. folio); besides many papers in the Philosophical Transactions.

MASON, WILLIAM, an English poet, was the son of a clergyman in Yorkshire, where he was born in 1725. He studied at Cambridge, where he received a fellowship in 1747. His first appearance in the literary world was by the publication of Isis, a poem, in which he satirized the Jacobitism and high church principles which prevailed in the University of Oxford. This piece provoked a reply from Thomas Warton, entitled the Triumph of Isis. In 1752 he published his Elfrida, a tragedy, with choral odes, on the ancient Greek model. Having taken orders in the church he obtained the living of Aston, in Yorkshire, and was appointed one of the royal chaplains. In 1759 appeared his Caractacus, a drama, on a kindred plan with the former. Some years after Mason was made precentor and residentiary canon at York. One of his principal works, the English Garden, a poem, appeared in four books between 1772 and 1782; and a second edition, with a commentary and notes by W. Burgh, was printed in 1785 (8vo). This work was translated into French and German. In 1775 he published the poems of his friend Gray, with memoirs of his life. His principal subsequent publications are: Odes; a translation of Du Fresnoy's Art of Painting, with Sir Joshua Reynold's notes (1783, 4to); the Life of William Whitehead, with his poems (1788, three vols. 8vo); and an Essay on Church Music (1795). Besides his acknowledged works Mason is supposed to have been the author of the Heroic Epistle to Sir William Chambers, and other satirical pieces, which were published under the signature of M'Gregor. At the beginning of the American war Mr. Mason became so active an advocate for freedom as to give offence at court, and he was consequently dismissed from his chaplainship; but alarmed by the French revolution, his zeal cooled in the latter part of his life. He died April 7, 1797.

MASON AND DIXON'S LINE, the line of 39° 43′ 26·3″ north latitude, which separates the states of Maryland and Pennsylvania, in the United States. Ever since the grant of the latter territory to William Penn by Charles II. in 1681 there were disputes between the family of Penn and that of the Lords Baltimore, the possessors of Maryland, as to the boundary between the two territories. An agreement was at last come to in 1760, and in that year commissioners were sent out to survey the territory and mark out the boundary line according to the terms of the agreement come to. At the end of three years the proprietors in England grew impatient of the slowness with which the work proceeded, and sent out two astronomers, Charles Mason and Jeremiah Dixon, to complete the line. The land that they had to survey was 270 miles in length, and mostly covered by dense forests, but before the close of 1767 the whole of their work had been accomplished except the last 36 miles. At this point, 244 miles west of the Delaware, they were obliged by the Indians to desist. Milestones were set up along the whole of this boundary line. Every fifth of these was marked with the arms of the Penn family on the one side and that of Lord Baltimore on the other. The others were marked with P. on the one side and M. on the other.

MASON BEES. These bees, of which the best known are the genera Osmia and Chalcidoma, are chiefly distinguished by their habit of building nests of particles of sand, mortar, and similar materials. The nests are generally oblong in shape, and the internal compartments or cells are arranged in an irregular manner. Within these cells the young larvæ are lodged, and from the cells they emerge as the perfect insects. The nests of the mason bees are described as common in the suburbs of Paris and other continental cities, being built against walls and in like situations; and in the Journal of the Proceedings of the Entomological Society of London (No. lxxvi., for 1867) an instance is recorded, where the lock of a door from the Kent Waterworks at Deptford was found to be filled up by the nests of the *Osmia bicornis*, one of the mason bees. A portion of the nest had been forced out by the introduction of the door-key. The locks were in comparatively active use, and the nests, destroyed by the applications of the key, must therefore have been restored and repaired with great rapidity. The mason bees, like the carpenter bees, leaf-cutters, and other allied forms, are solitary in habits, not living in communities like the ordinary bees and wasps.

MASONRY. See ARCHITECTURE.

MASONRY, FREE. See FREEMASONRY.

MASON SPIDER (*Mygale cæmentaria*). These spiders, sometimes also known by the popular appellation 'Trap-door Spiders,' are common along the European borders of the Mediterranean Sea, and are found in especial plenty in the Ionian Islands. They are included in the family of the Mygalidæ, and are of large size. The palpi are much elongated, and terminate in claws, and the mandibles or large jaws are also largely developed. The legs are strongly made; and the eyes are large, and placed close together at the front part of the body. The mason spiders excavate pit-like traps, averaging a foot and a half in depth, and this cavity is lined by the silk secretion characteristic of the class, so as to adapt it for a comfortable abode. The entrance to the pit is guarded by a hinged-door, which, when closed, effectually conceals the aperture. This door is constructed by the spider first spinning a web over the entrance, which, however, is fixed by a single point only to the margin of the aperture. Over this silky layer a stratum of earth or soil is spread, and this latter layer is in turn covered by a second layer of silk; and this alternation of materials is pursued until the requisite thickness has been attained. The single attached point of the web forms the hinge of the door, which thus accurately fits the opening of the pit. And in some species the hinge is extended backwards to form a projection, which, on being pressed, opens the door by its leverage. These spiders, like their more familiar neighbours, may feed upon insects, but many of the Mygalidæ trap birds of small size.

MASORA, or MASSORAH, a Hebrew word signifying 'tradition,' the name of a collection of notes referring to the Hebrew text of the Old Testament, and written in Chaldee chiefly on the margin of Hebrew MSS. These notes are various in their character, critical, grammatical, and explanatory, and include an indication of the vowel-points and accentuation of the Hebrew text according to the Jewish tradition. This latter circumstance especially makes the Masora indispensable for a thorough study of the Hebrew Scriptures. The Masora also gives the number of words and forms found in the Hebrew text, points out grammatical irregularities, and makes remarks on orthography, on the division into books and sections, &c. At what time the accumulation of these notes was commenced cannot be ascertained. According to some Jewish writers the notes are in some cases as old as the time of Moses; according to others they were begun in the time of Ezra. A large part of them were compiled in the Jewish schools of Tiberias subsequent to the third century, and it is certain that the collection was not completed till the eighth century at the earliest. The most recent edition of the Masora is that of Frensdorff, published at Hanover (1867, fgg.), under the title Massora magna.

MASQUE, or MASK, a theatrical drama, much in favour in the courts of princes during the sixteenth

and seventeenth centuries, in the latter particularly in England. They are the most brilliant and imaginative among the entertainments of our English ancestors, and are traced, with much probability, to the religious processions of the Church of Rome, in which various scriptural characters were represented with some occasional tinge of burlesque solemnity. The masque, or as we should rather call it in its infancy, the *masquerade*, in order to distinguish it from the species of drama into which it ultimately ripened, early became a prevalent fashion among the princes and nobles of Europe. The court of Henry VIII., before the tyrant's sanguinary licentiousness had deluged it with blood, presented many of these gorgeous spectacles. According to Holinshed's Chronicle the first masque performed in England was in 1510, in the first year of Henry's reign. In 1530 a masque was performed at Whitehall, 'consisting of music, dancing, and a banquet, with a display of grotesque personages and fantastic dresses.' Shakspere, Beaumont, and Fletcher have frequently introduced masques into their plays. The parts in the masques of the sixteenth and seventeenth centuries were usually represented by the first personages of the kingdom: if at court the king, queen, and princes of the blood often performed in them. James I. carried to its height the glory of the masque. It had hitherto consisted of music, dancing, gaming, a banquet, and a display of grotesque personages and fantastic dresses; but it now assumed a higher character, and became 'married to immortal verse.' Previously 'their chief aim,' says Warton, 'seems to have been to surprise, by the ridiculous and exaggerated oddity of the visors, and by the singularity and splendour of the dresses. Everything was out of nature and propriety. Frequently the mask was attended with an exhibition of some gorgeous machinery, resembling the wonders of a modern pantomime; for instance, in the great hall of the palace, the usual place of performance, a vast mountain covered with tall trees arose suddenly, from whose opening caverns issued hermits, pilgrims, shepherds, knights, damsels, and gipsies, who, being regaled with spices and wine, danced a morisco or morris dance. They were again received into the mountain, which, with a symphony of rebecs and recorders, closed its caverns, and tumbling to pieces, was replaced by a ship in full sail or a castle besieged' (History of English Poetry, section 44). This glittering chaos was reduced to order by the genius of Ben Jonson. In his masques, along with much that is frigid, wearisome, and pedantic, may also be found much fine poetry. Inigo Jones was for a number of years exclusively employed upon the decorations and elaborate machinery of the court masques, and Henry Lawes wrote the music for several of them. The masques, though they make a great show on paper, were probably not a little defective in exhibition. Sir Dudley Carleton, an eyewitness, writes as follows: 'At night we had the queen's maske, in the banqueting-house, or rather, the pagent. There was a great engine at the lower end of the room, which had motion, and in it were the images of sea-horses and other terrible fishes, which were ridden by Moors. The indecorum was that there was all fish and no water. At the further end was a great shell, in form of a skallop, wherein were four seats, on which sat the queen and her ladies. Their apparel was rich, but too light and courtezan-like for such great ones. Instead of vizards their faces and arms up to the elbows were painted black, which was disguise sufficient, for they were hard to be known; but it became them nothing so well as their red and white; and you cannot imagine a more ugly sight than a troop of lean-faced Moors' (Winwood's Memorials, ii. 44). Milton's Comus is the most beautiful of the productions which bear the name of masque. This exquisite specimen of lofty thought, beautiful imagery, and splendid versification, is said by Gifford to be defective as a masque, and by D'Israeli not to be a masque at all, referring, probably, to the deficiency of music and machinery. The taste for masques decreased in the reign of Charles I., and after the interruption given to the progress of dramatic art and literature by the civil war they were not again brought into fashion.

MASQUED-BALL, an entertainment, generally of a public character, in which the company are masked, or otherwise disguised by dominoes. This kind of amusement became popular in Italy about the year 1512, about which time it was introduced into England by Henry VIII. It is popular in the large cities on the Continent, particularly in carnival time. The *bal costumé*, in which the dancers appear in fancy costumes, but unmasked, is the nearest approach which English taste and law allow to this species of entertainment, which, from its nature, is peculiarly liable to abuse.

MASS, properly speaking the prayers and ceremonies which accompany the consecration of the eucharist. The word is used generally for all that part of the Catholic service in which the eucharist is offered. The Latin word is *missa*, which name in early times designated the public service of the Christians, celebrated under the direction of a *leitourgos* (see LITURGIA), generally the bishop himself, with the assistance of several servants of the altar (the elders, deacons, and others) in presence of the whole community. The people not only understood what was done, but also sung, responded, prayed, and received bread and wine in the Lord's supper. Very early, however, it became customary, and according to many universal, during the first three centuries, to divide the divine service into two chief parts, by separating the rest of the service from the celebration of the eucharist. Only the faithful, who lived actually in communion with the church, were allowed to be present at the latter: at the former, also the *catechumens*, the penitents, and even unbelievers; but these classes were dismissed before the celebration of the eucharist was begun by the words, 'Catechumeni, exite, missa est' (that is, *concio*, the meeting), or 'Si quis catechumenorum remanserit, exeat foras.' Thus they were dismissed (*dimissio, missio, missa*), from which circumstance, in the sequel, the whole service received its name; hence, again, the division of *missa catechumenorum* and *missa fidelium*. When the number of the faithful increased, and communities of Christians rose, not merely in the cities, but also in the villages, the celebration of divine service was intrusted also to priests, who at first officiated only before the whole community, and on days appointed for the purpose; at a later period also on ordinary days, and even alone, for their own benefit, with the assistance of one altar-servant only. Thus originated with the high or solemn mass also the low or private mass, performed by the priest, assisted by one altar-servant only. The Protestants consider this, even according to the Catholic doctrine of the mass itself, a great abuse, and many Catholic authors have concurred with them; while others maintain that it is indispensable, as it would be impossible otherwise to consecrate the host for the sick, &c. If the mass is of such supernatural efficacy as a great part of the Catholics consider it; if it is an actual and repeated sacrifice of Christ for our sins—private masses may also be admissible, though the form of the celebration, founded on the supposition of the presence of the people, may be inconsistent with them. The celebration of the eucharist or the mass separate from the preaching became more and more common, and

the actual participation of the people in it gradually lessened. The responses, &c., were made by a servant of the altar, and the priest alone took the sacred elements—changes to which the people accustomed themselves the more readily as the knowledge of the ancient languages, in which the masses were performed (in the Oriental Church the Greek, and in the Latin Church the Latin), became more and more limited. The choir of priests and servants, including at a later period the singers and musicians, took the place of the people, and the whole difference of the solemn and the private mass came to consist in this circumstance only, the people having ceased to take any part in the mass, and the sermon being delivered separate from this ceremony. This state of things has remained to this day, at least in by far the greater number of Catholic countries.

The mass, then, at present consists of four chief parts:—1. The introduction, which forms its chief part, is called the *catechumenum*, and formerly constituted, with the sermon, the mass of the catechumens; 2, the *offertorium*, or sacrifice; 3, the consecration or transubstantiation; 4, the communion. These four chief parts, of which the latter three are considered the most essential, are composed of several small parts, each having its proper denomination; they are prayers, songs, shorter and longer passages of the Holy Scriptures, and a number of ceremonies, which, as the essential point of the mass is the sacrifice of the Lord, consist partly of symbolical ceremonies commemorative of important circumstances in the Saviour's life, or signs of devotion and homage paid to the presence of the Lord in the host. The order of these ceremonies, and of the whole celebration of the mass, is given in the missal, or mass-book. The masses are modified according to many circumstances. Thus certain parts are changed according to the saint in honour of whom the mass is celebrated, or the seasons of the year connected with different events in the Saviour's life, or the purpose for which the mass is said, as the *missa pro defunctis* (mass for the dead), or that intended for the invocation of the Holy Ghost, and others. Deviations from the established rite gave rise to the *missa bifaciata*, *trifaciata*, *multifaciata*, formed by uniting two, three, and more masses under one canon. *Missa præsanctificatorum* is that in which the host has been consecrated one or several days beforehand, which is more common in the Greek Church than in the Latin. *Missa sicca*, or *dry mass*, is that which was celebrated without the consecration of the bread and wine: for instance, on board of vessels, in order to prevent the spilling of the sacred elements. It is no longer in use. The *mass of the day* is such as is proper to the season, or to the feast which is celebrated. *Votive mass* is an extraordinary mass, besides that of the day, rehearsed on some extraordinary occasion. *High mass* is celebrated by a deacon and sub-deacon, and sung by the choristers. Besides these there are different masses according to the different rites: the *Greek mass*, the *Latin mass*, the *Roman* and *Gregorian mass*, *Galican*, *Gothic mass*, &c.

MASS, the quantity of matter in a body. The mass of a body is the same wherever the body may be in the universe. Two bodies have equal masses if the gravitating forces with which another body acts upon them are exactly equal at equal distances. (See GRAVITATION.) Hence two bodies have equal masses if their weights are the same at the same place on the earth; so that if the metallic 'weight' used by a grocer is carried from place to place, the quantities of sugar and tea balanced by it in a good pair of scales will always be the same, for the mass of tea or sugar is in every case equal to the mass of the metallic 'weight.' It is to be clearly understood that as the force of gravity is different at different places on the earth, the weight of any body is different at different places. To distinguish between the mass (or quantity of matter) and the weight (or force which tends to move it downwards) of a body is very important in beginning the study of physics. The mass of a certain piece of metal kept in the exchequer chambers, and called 1 lb. avoirdupois, is the common English unit of mass. Physicists employ as unit the mass of a cubic centimetre of pure water at 4° C. and the pressure of one atmosphere, or rather the mass of a certain piece of metal kept in Paris, called a *gramme*, and supposed to represent the above. See GRAMME, MECHANICS.

MASSA-CARRARA, an ancient small sovereign state of Italy, situated on the western slope of the Apennines, bounded principally by Tuscany and the Duchy of Modena. Its earliest rulers were successively of the Malaspina and the Cibo families. In 1741 it passed into the hands of Hercules III., hereditary prince of Modena. In 1796 it was held by the French, but was restored to Maria Beatrice, daughter of Hercules, in 1814. She was succeeded in 1829 by her son Francis IV., duke of Modena, who reigned until the revolution of 1859 expelled all the petty princes of the peninsula, and brought about the unification of Italy. It was then united with those portions of the duchies of Parma and Modena lying west of the Apennines, and erected into the province Massa e Carrara. The province is celebrated for the production of the beautiful white Carrara marble, much used in sculpture, and of which are built many of the houses of its two principal towns Carrara and Massa-Ducale. Area, 685 square miles; pop. (1880), 181,007.

MASSACHUSETTS, one of the Atlantic United States of North America, bounded north by Vermont and New Hampshire; east by the Atlantic; south by the Atlantic, Rhode Island, and Connecticut; and west by New York; length, 160 miles; with a varying breadth of from 50 to 90 miles; area, 8315 square miles; capital city, Boston. The coast-line of the state, which has a length of about 250 miles, is indented with deep and extensive bays, of which Massachusetts Bay, whence the state is named, and which includes the large bays of Boston and Cape Cod, Buzzard and Nantucket Bays, are the most capacious. The indentations in these bays form excellent harbours, the most commodious of which are Newburyport, Boston Harbour, and Marblehead. The islands of Nantucket and Martha's Vineyard, with the Elizabeth, and several other small islands, belong to Massachusetts. The west part of the state is traversed by the Green Mountain, whose loftiest peak rises 3500 feet above sea-level. A low range enters Massachusetts east of the Connecticut, by which it is divided, below Northampton, into two ridges, the two highest peaks of which are Mount Tom on the west of the river, and Mount Holyoke on the east. To the east of this range are some detached mountains, one of which, Wachuset, rises between 2000 and 3000 feet above sea-level. The most considerable rivers are the Connecticut, Housatonic, and the Merrimac. None of them are naturally navigable; but the Connecticut, which traverses the state for 50 miles of its course, has been made navigable by art for small craft. The Merrimac has a course of 35 miles through the north-east corner of the state, and its valuable water-power has been taken advantage of by the manufacturers of Lowell, Lawrence, and Haverhill. The soil is poor and sandy near the coast, where salt marshes frequently occur; but in the middle and western parts it is very fertile, and well cultivated. Iron mines and quarries of granite, syenite, white marble, and slate are wrought extensively

sively; and copper, anthracite coal, yellow ochre, serpentine, and asbestos are also found. Fish abound in the rivers and in the sea. The climate of Massachusetts is liable to extremes of heat and cold. The mean annual temperature is about 48°. The principal vegetable productions are Indian corn, rye, oats, potatoes, hemp, flax, pease, hops, beans, and pumpkins; wheat, buck-wheat, and barley are raised only in small quantities. Some silk and a good deal of sugar are produced. Excellent hay is grown on some of the salt marshes of the coast, and the Connecticut Valley yields annually over 5,300,000 lbs. of tobacco. A considerable portion of the surface of the ground is still covered with forests, consisting of pine, oak, walnut, birch, maple, ash, cedar, cherry, and chestnut. All the fruit-trees of England are cultivated with success. Massachusetts is, in regard to the actual amount of its manufactures, the third state in the Union, being excelled in this respect only by New York and Pennsylvania; but in proportion to its area and population it is the first. In the cotton manufactures she employs about 63,000 workers, about one-third of the whole of the operatives so employed in the United States. Lowell is the great centre of the cotton manufactures. Worsted goods, hosiery, silks, linens, &c., are largely manufactured. There are numerous forges and furnaces; machine-shops, and also manufactures of edge-tools, agricultural implements, and cutlery to a large extent. Other articles of manufacture are beer, leather, small-arms, glass, paper, &c.; the manufacture of boots and shoes is very large. Ship-building is carried on extensively. The trade, both foreign and domestic, is extensive. The most important exports are dried and salted fish, train and spermaceti oil, salted beef, flour, soap, candles, leather, and cotton goods; and the imports chiefly coffee, sugar, molasses, indigo, iron, and hemp, with, silk, linen, and woollen goods of English manufacture. In shipping it is far superior to any other state of the Union except New York. The means of internal communication are ample, through a complete system of railways, and several navigable rivers, supplemented or aided by canals. The total length of railways within the state at the end of 1882 was 1966 miles. In connection with the railways may be mentioned the Hoosac Tunnel piercing the Hoosac Mountain in the north-west corner of the state to a length of 5¾ miles, thus ranking among the longest tunnels in the world.

In educational matters Massachusetts has attained a high reputation. In 1880 there were 5570 free public schools, with an attendance of 307,321 pupils, the total expense of which, nearly £1,300,000, is met by state, county, and municipal taxation. The system includes common, high, and normal schools, with evening and industrial schools. Of the higher educational institutions we can only mention Harvard University, the oldest in the Union, with an attendance in 1882 of nearly 1400 students; Boston University, with 510 students; and Amherst College, with 340 students. Besides these there are many colleges, institutes, and schools specially devoted to particular branches of instruction, such as theology, law, medicine, science, art, agriculture, and so forth.—The executive department of the government is vested in a governor, assisted by a lieutenant-governor, and eight councillors, representing so many council districts of the state; these functionaries all being elected for one year. The legislative departments consist of the Senate of 40 members and the House of Representatives of 240 members, which two bodies form together what is called the General Court; the members are in these cases also elected for one year. Massachusetts sends two senators to the United States Congress, and twelve members to the House of Representatives. The constitution is the same (with the addition of several amendments, the last of which were adopted in 1863) as that under which the state received its organization in 1780. Massachusetts is divided into fourteen counties; and besides the capital, Boston, the towns with a population above 25,000 are Fall River, Lawrence, Lynn, New Bedford, Salem, Springfield, Cambridge, Charlestown, Lowell, and Worcester. It was at first composed of two colonies—Plymouth colony, first settled by 120 Puritan families, who landed in Plymouth in 1620; and Massachusetts Bay colony. These two were united in 1692, under the name the state now bears. The American revolution commenced in Boston and its neighbourhood; and the battle of Bunker's Hill, in its suburb Charlestown, was the first regular engagement fought during that memorable struggle. When the civil war broke out in 1861 the soldiers of Massachusetts were the first under fire at Baltimore, and during the conflict she furnished much beyond her quota of soldiers and sailors. Pop. in 1880, 1,783,085.

MASSACHUSETTS BAY, a large bay situated east of the central part of Massachusetts, and bounded on the north by Cape Ann, and on the south by Cape Cod.

MASSAGETÆ, a collective name given by the ancients to the nomadic tribes of Northern Asia who dwelt to the east and south of the Caspian Sea, as far as the frontiers of the Persian monarchy. Their manners and customs resembled those of the Scythians generally. Herodotus says they worshipped and offered horses to the sun, had a community of wives, killed and ate their aged people, lived chiefly on the milk and flesh of their herds and on fish, and fought on foot and on horseback with lance, bow, and double-edged axe. The name often occurs in the Scythian and Persian histories; in the latter particularly in the campaigns of Cyrus, who lost his life in fighting against them. According to Niebuhr and Böckh they belonged to the Mongolian stock; but Humboldt and others say to the Aryan race.

MASSÉNA, ANDRÉ, Duke of Rivoli and Prince of Esslingen, Marshal of France, was born in 1758 at Nice, and rose from a common soldier to the rank of commander. When quite young he was for a time cabin-boy on board his uncle's vessel, but in 1775 entered the French army, in which he became an inferior officer. After fourteen years' service he left the army, and returned to Nice, where he married. During the revolution he entered a battalion of volunteers, was elected chief of his battalion (Aug. 1, 1792), and such was his military ability that in 1793 he was made general of brigade. In April, 1794, he was appointed general of division, and took command of the right wing of the French army in Italy. He was the constant companion in arms of Bonaparte, who after the successful battle of Roveredo (1796), called him the favourite child of victory. The commander-in-chief sent him to Vienna to conclude the negotiations for peace, and in 1796 to Paris, to procure the ratification of the treaty. While Bonaparte was in Egypt Masséna and Moreau were the hope of France. In 1799 Masséna displayed his ability as commander-in-chief in Switzerland. After having opened the war with success he was forced to fall back to the Albis, on account of the ill fortune of Jourdan on the Danube. Here he took a strong position, watching his opportunity, and by the battle of Zürich (September 25) prevented the junction of Korsakoff and Suwaroff, who had already ascended Mount St. Gothard. Suwaroff was completely defeated, and sustained a loss of two hundred guns and five thousand prisoners. This battle, the first that the Russians had lost in the open field for a century, decided the separation of Russia from Austria, and saved France. After

Masséna had reconquered the Helvetian and Rhætian Alps, he was sent to Italy to check the victorious career of the Austrians. He hastened, with the small force which could be assembled, to the support of Genoa, his defence of which is among his most remarkable achievements. Ten days before the battle of Marengo, when all his resources were exhausted, Masséna obtained an honourable capitulation. The Consul Bonaparte, who now returned to Paris, gave him the chief command of the army. Peace soon followed. Masséna was chosen member of the *corps législatif* by the department of the Seine, and in 1804 was created marshal of the empire. In 1805 he received the chief command in Italy, where he lost the battle of Caldiero. When the Archduke Charles was compelled, by the ill success of the German arms at Ulm, to retire to Inner Austria, Masséna pursued him, but was unable to gain any advantage over him. After the Peace of Presburg Masséna was sent by Napoleon to take possession of the Kingdom of Naples for Joseph, and captured Gaeta. After the battle of Eylau, in 1807, Napoleon summoned him to Poland to take the command of the right wing of the French army. After the Peace of Tilsit, war having broken out in Spain, Masséna took the field with the title of Duke of Rivoli; but in 1809 he was recalled to Germany. He was present in the battles of Eckmühl, Ratisbon, Ebersberg, Esslingen, and Wagram. At Esslingen his constancy and firmness saved the French army from total destruction; and Napoleon rewarded him with the dignity of Prince of Esslingen. After the peace he hastened to Spain to deliver Portugal from the hands of the British. Wellington retired before him, and took a strong position at Torres Vedras, for the defence of Lisbon, till want of provisions compelled Masséna to retire. Napoleon recalled him from Spain, and in 1812 left him without a command. In 1814 he commanded at Toulon, declared for Louis XVIII., and was created commander of the order of St. Louis. When the emperor was re-established he swore allegiance to him, and was made peer and commander of the national guard at Paris, and contributed much to the preservation of tranquillity in the city during the turbulent period which preceded the return of the king. He lived afterwards in retirement, and his death was hastened by chagrin at the conduct of the royalists. He died April 4, 1817.

MASSILLON, Jean Baptiste, one of the greatest pulpit orators of France, was born in 1663 at Hyères, in Provence; entered, in his eighteenth year, the congregation of the oratory, and became a general favourite by his pleasing manners, which, however, excited envy. He was accused of some amours, and attempts were made to exclude him from the congregation, and it is said that he retired for some months to the abbey of Sept-Fonts. The applause with which his funeral sermon on the Archbishop Henri de Villars was received induced the general of his congregation, La Tour, to call him to Paris. He was obliged to obey, and, against his inclination to ascend the pulpit, where his genius soon showed itself in all its power and peculiarity. According to some an answer to a pastoral letter of the Cardinal Noailles, which Massillon drew up in the name of his convent, attracted the attention of the cardinal, in compliance with whose order he returned to the oratory. The applause which he met with in Paris, even at court, was almost without example. The effect of his Sermon du petit Nombre des Élus was almost miraculous. Massillon spoke with that powerful simplicity which can be resisted only by utter want of feeling. After he had preached the first time at Versailles, Louis XIV., who was famous for the happiness of his compliments, addressed him with the words, 'On hearing other orators I have often been much pleased with them, but having heard you I was much displeased with myself.' His delivery contributed much to the effect of his eloquence. With apparent artlessness, nay even negligence, he produced a greater effect than others with studied art. The famous actor Barron once exclaimed, after hearing one of Massillon's sermons, 'There is an orator; we are but actors.' On account of his amiable temper and manners he was chosen to reconcile Cardinal Noailles with the Jesuits; but he found that it was much easier to convert sinners than to reconcile theologians. The regent appointed him in 1717 to the see of Clermont, which he could not have accepted, had not a friend of his paid the expenses connected with it. In the year following he was chosen to preach before Louis XV., then nine years old, and wrote a series of sermons, ten in number, so famous under the title of Petit-Carême, which are master-pieces of pulpit eloquence. They are remarkable also for the political truths which they contain; among others, that the monarch is made for the people, who appointed him, in conformity with the order of God; that not the prince, but the laws should rule, of which the monarch is but the minister and guardian. In 1719 Massillon was chosen a member of the Academy. Cardinal Dubois procured him the prelacy of Séviny. His last discourse in Paris was the funeral sermon on the Duchess of Orleans. From that time he never left his diocese, where his virtues, particularly his charity, had procured him the reverence of all. He died in 1742. His nephew published a complete edition of his works (1745 et seq.; reprinted at Paris in 1762, in thirteen vols. 8vo; and at Lyons, Leroy, and Lusand, in fifteen vols. 12mo).

MASSINGER, Philip, a distinguished English dramatist, in the beginning of the seventeenth century, was the son of a retainer of the Earl of Pembroke, and was born at Salisbury in 1584. He studied at Oxford, but quitted the university without taking a degree, in consequence, perhaps, of his having become a Roman Catholic; or according to Anthony à Wood, in consequence of the withdrawal of supplies by his patron the Earl of Pembroke, who was displeased at his spending his time over poetry and romances instead of logic and philosophy. He repaired to London about 1606. Little is known of his personal history, yet he appears to have been intimately connected with the wits and poets of his time, in conjunction with some of whom, as Fletcher, Middleton, Rowley, and Dekker, he composed some of his dramas. He died in 1639, it is supposed in rather straitened circumstances. He was buried in the churchyard of St. Saviour's by the hands of the actors; and the parish register contains the pathetic entry, 'March 20, 1639 1640, buried Philip Massinger, a stranger.' As a dramatist Massinger is more natural in his character and poetical in his diction than Jonson or Cartwright, and some critics rank him next to Shakspere. In tragedy, however, he is rather eloquent and forcible than pathetic; and in richness and variety of humour his comedy can by no means vie with that of his great master. His best plays are The Duke of Milan, A City Madam, A Very Woman, The Fatal Dowry, A New Way to Pay Old Debts. The last-mentioned still maintains its place on the stage, for which it is indebted to the powerful delineation of the character of Sir Giles Overreach. His plays were published collectively by Mr. J. M. Mason and Mr. T. Davies, in 1779, four vols. 8vo; but the best edition is that of Mr. W. Gifford, with notes and a life of Massinger (four vols. 8vo, 1805).

MASSOWA, the principal seaport of Abyssinia, on a small barren coral island in the Red Sea, about

1 mile long by 300 yards to 400 yards broad, at the northern extremity of Arkeeko or Argeego Bay, and only a few hundred yards from the mainland. The town is partly built of stone, but most of the houses are constructed of poles and bent grass, and surrounded by a fence of reeds. The most considerable buildings are the mosques, the houses of the traders, and a few warehouses, which are built of coral, and also the bazaar. About 250 Arab boats, of 40 to 200 tons, and one or two European vessels, of 300 to 400 tons, arrive annually. The chief imports are grain, gold, cotton manufactures, glasswares, arms, cutlery, spices, wines, and spirits; principal exports, rhinoceros-horns, gold, ivory, honey, slaves, and wax. These are brought by caravans from the interior. The island is dependent on Egypt, and is ruled by a governor appointed by the khedive. Pop. estimated at 4000.

MAST. See SHIP.

MASTER, in the British navy, was formerly the name of the officer who had the charge of the details of the navigation of the ship under the general orders of the captain, and to whose care were intrusted such of the stores as were not in charge of the paymaster. For his assistants he had the second master, master's assistants, and the ship's quartermasters. He entered the navy as master's assistant, and after long service became staff-commander and staff-captain. The duties discharged by the master have latterly been consigned to an officer known as *navigating lieutenant*, and who has undergone a special examination in navigation. The rank of master still exists in the navy of the United States, in which they hold a position above that of ensign and below that of lieutenant.

MASTER, in the mercantile navy, is the person intrusted with the chief command of the vessel, and is usually styled by courtesy captain. His duties consist in the maintenance of discipline, the navigation of the vessel, the charge of the cargo, and many other important functions. The master is the confidential servant or agent of the owners, who are bound to answer for a breach of contract committed by the master or mariners even against the will or without the fault of the owners. The master has power to hypothecate or pledge the ship and cargo for necessary repairs executed abroad, but not for those executed at home. He has no lien upon the ship for his wages, nor for money advanced by him for stores or repairs. He is bound to employ his whole time and attention in the service of his employers, and is not at liberty to enter into any engagement for his own benefit that would occupy his time in other concerns. He may enforce obedience to his lawful commands by reasonable and moderate chastisement; but is liable to damages if he does so without cause. He may by force prevent the commission of a great crime, but has no jurisdiction over the criminal; his business is to secure the person, and deliver him to the proper tribunals. Every injury which may be provided against by ordinary care renders the master responsible. He would not, for instance, be held liable for damage done to goods by a leak in the ship caused by a violent storm or other unavoidable accident; but if the damage was occasioned by rats he would be liable, for these might have been destroyed by ordinary care. Or if he run the ship in fair weather against any rock or shallow known to experienced navigators he is liable, as he is also for injury done to the cargo by improper stowing. He must not take on board any contraband goods or false papers, as this might subject the ship to the risk of capture and detention. He is compelled to keep a proper log-book, and must produce it, with the ship's papers, on the requisition of the commander of a ship-of-war of his own nation. He is bound to come to a written agreement with each of his men before sailing, as to the wages to be paid. He is also bound to bring home and subsist, to the number of four for every 10 tons, British seamen who may have been cast away, captured by the enemy, or by other unavoidable accident left upon a foreign shore. For these he will be granted head-money by the admiralty. Under the Mercantile Marine Act the board of trade grants certificates of competency to masters of vessels after examination by the local marine board. These certificates may be withdrawn on a want of skill being evinced. A certificate of this nature must be held by every master of a home or foreign passenger ship. Certificated masters are eligible for the naval reserve with the rank of lieutenant.

MASTER AND SERVANT. In legal acceptation a servant is one who owes his services to another for a limited period, but not for life, or who, in other words, is not a slave. Servants consist of two classes, namely, those who receive wages and apprentices. The contract for service in the respective cases is quite different: in each the servant is bound to render service, but in one the master is bound to pay the stipulated wages; in the other to give instruction. (See APPRENTICE.) Servants are of several descriptions: agricultural labourers, operatives or skilled labourers, and menials or domestic servants. In England and Ireland, if the contract for service is for more than a year, it must be drawn up in writing; if for a year or less, or for an indefinite period, it may be verbal. If the contract is for a year, and if the servant is discharged without just cause during the year, he may claim wages up to the end of the year; on the other hand, if he leave without cause before the time, he can claim no wages at all. If he happen within the year to fall sick, or be hurt or disabled in the service of his master, the master cannot put him away or abate any part of his wages for that time. The master is not bound to provide medical attendance if a domestic servant falls sick during the time of the service; but if a doctor is sent for by the master without any express understanding, the master may be liable on the ground that he was sent for by and gave credit to the master. In the case of a year's engagement warning must be given a quarter before the service terminates. If a yearly servant is discharged for conduct warranting the discharge, all his wages may be forfeited. If a domestic servant be engaged under no special contract, a month's warning or payment of a month's wages is all that is necessary. Operatives may be discharged or may leave at a week, a fortnight, or month's notice, according to the recognized local or trade usage. The grounds on which a servant may be legally discharged without warning are wilful disobedience, gross immorality, habitual negligence, and incompetence. He is bound to execute all lawful commands of his master if they fall within the sphere of the particular service for which he was engaged: thus a gardener is not bound to do the duties of a footman. Every servant is bound to take care of his master's property, and is liable to an action for gross negligence and also for fraud and misfeasance. In general if a servant refuse to enter the service, or leave it without sufficient cause, he is liable merely to an action for breach of contract, which is really no remedy at all, few servants being worth the expenses of a suit. As this conduct would often cause great loss to employers of skilled labourers and agricultural servants, statutes have been passed giving a power to justices of the peace to compel the servant to remain in the service until his legal notice to leave has been worked out, or in case of non-compliance to summarily punish him with imprisonment. This rule does not apply to domestic servants.

A master has no right to chastise a servant, whatever the servant's age may be, but has the right of moderately correcting an apprentice under age. He is also liable in cases where his servant in the ordinary course of his duty, and acting within the scope of implied or expressed orders, injures a third party; but if the servant be acting contrary to orders the master is not liable, nor is he so responsible for crimes or criminal offences committed by the servant. A master can turn a domestic servant out of his house at a moment's warning without notice on payment of wages for the full term of the engagement; but if he does so without just cause, the servant is entitled to board wages for the same period. The death of the master discharges the contract; but in Scotland the servant can claim wages for the whole of the contracted period, but is bound in that case to serve the master's executors. In case of the bankruptcy of the master the servant is a privileged debtor for wages due and unpaid for three months, but ranks as an ordinary creditor for the balance; in Scotland he has a preferential claim for the whole amount of wages for the current term. A master is not liable for the consequences of any injury happening to the servant in the discharge of his duties, unless culpable negligence can be proved on the master's part. If one servant is injured by another, the rule is that the injured party can sue the master, unless the servants were engaged in a common operation, in which case the servants are considered as a check upon each other. A master is not legally bound to give a discharged servant any character; but if a character be given, it must be in accord with the truth. If a master knowingly gives a false character to a servant who is engaged by a third party on the faith of it, and who robs such third party, the latter can sue the former master for damages. If a bad character is untruly and maliciously given, the master is liable to an action for defamation; but until the untruth and malice have been proved, the communication is held to have been privileged, and no action is sustainable. Individuals personating masters, and giving false characters, and servants using such characters, may be summarily convicted and fined £20. A master cannot, without express stipulation, deduct from the servant's wages the value of articles broken by the servant, even if through want of care, however gross.

If any person entice away a servant, and thereby cause loss to the master, the latter may sue such person for the injury. If the servant is a female, and is seduced, and thereby unable to perform her duties, the master can bring an action against the seducer for the loss of service caused thereby; and on the same principle, if a third person causes such personal injury to a servant as unfits him for the discharge of his duties, the master can sue the third person. If a female servant marries she must serve out her term if insisted on, her husband having no power to take her out of her master's service. Any person retaining a servant who has left his former situation without just cause and due notice is liable to an action if he knows the manner in which the servant acted. A master may support an action at law against a third party, and may even justify an assault in defence of his servant, as may a servant in defence of his master.

MASTER IN CHANCERY. The masters in chancery were assistants to the lord-chancellor and master of the rolls. Of these there were some ordinary and others extraordinary; the masters in ordinary were twelve in number, some of whom sat in court every day during the term, and had referred to them interlocutory orders for stating accounts and computing damages and the like; and they also administered oaths, took affidavits, and acknowledgments of deeds and recognizances. The masters in chancery were abolished with certain reservations by 15 and 16 Vict. cap. lxxx. (1852).

MASTER OF ARTS (M.A. or A.M., *artium magister*), an academical honour conferred by the universities of Britain, the United States, Germany, &c., upon students after a course of study and a previous examination in the chief branches of a liberal education, particularly philosophy, philology, mathematics, physics, and history. The word *magister*, connected with a qualifying phrase, was used among the Romans as a title of honour; but its present meaning must be traced to the time of the establishment of the oldest universities. Regularly organized faculties were not then known as they now exist in the universities. The whole circle of academic activity was limited to the seven liberal arts (see ART); and they who received public honours on the completion of their course of studies, for their diligence and knowledge, and had already received the degree of *baccalaureus* (bachelor), were called *magistri artium* (masters of the liberal arts). The precise period of the introduction of this title is not known; but even in the twelfth and thirteenth centuries the honour was so highly esteemed in France that the most distinguished men were eager to obtain it. After that time, when the distinction between the different faculties was established, when the universities were multiplied, and many abuses crept in, it lost to some extent its former importance. In the English universities this degree follows that of Bachelor. It is the highest in the arts faculty, but inferior to that of Bachelor of Divinity. Soon after obtaining his degree a master becomes a regent, and has the privilege of voting in congregation or convocation at Oxford and in the senate at Cambridge; and in the Scottish universities of becoming a member of the general council on payment of a fee. In some of the German universities the title is united with that of Doctor of Philosophy (Ph.D.), while others confer the latter title alone, which then corresponds to the degree of M.A. in our universities. This title is an indispensable preliminary to the attainment of the position of *magister legens* in the German universities, that is, one who has obtained the right to deliver academical lectures.

MASTER OF COURT is the title given in England to the chief officers under the judges. There are five masters on the plea side of each of the courts of Queen's Bench and Exchequer, and also in the Common Pleas. Their duties comprise the taxing of costs, computing of damages, and attending the judges in court. By recent acts the masters now transact a considerable amount of the business at Judges' Chambers.

MASTER OF THE BUCKHOUNDS, an officer of the royal household, in the master-of-the-horse's department. He is intrusted with all matters connected with the royal hunts. The office is one of considerable political importance; a salary of £1700 is attached to it, and the master goes out of office on a change of ministry.

MASTER OF THE HORSE, the third chief officer in the royal household, whose duty it is to superintend the royal stables and all horses belonging to the queen. He has authority over all the equerries and pages, grooms, coachmen, saddlers, and farriers, and has the appointment and control of all persons working for the queen's stables. He has the privilege of using the royal horses, pages, and servants, and rides next to the queen on all state occasions. His tenure of office, to which an annual salary of £2500 is attached, is dependent upon the existence of his political party in power.

MASTER OF THE ROLLS, a patent officer for life, who had the custody of the rolls of Parliament, and patents which pass the great seal, and of the records of chancery, &c. This charge has now, however, become merely nominal, as the custody has been intrusted to officers not in his appointment or control. In the absence of the chancellor he sits as judge in the Court of Chancery; at other times he hears causes in the Rolls Chapel, and makes orders. He has a writ of summons to Parliament. The salary attached to the office is £7000 a year.

MASTER-SINGERS (German, *Meistersinger*). In the thirteenth century, in Germany, as in other European nations, poetry was a favourite occupation at courts and among the knights; but with the beginning of the fourteenth century this peaceable disposition ceased almost entirely, and incessant feuds almost everywhere ensued. Industry and the arts, however, grew up behind the walls of the cities, and the corporations of citizens were established. During the long evenings of winter the worthy burghers of the German cities assembled to read the poems of the minstrels. Some of the hearers were naturally led to try their own skill in verse; others followed, and the spirit of the age soon embodied these votaries of the muse in corporations, or at least societies after the fashion of corporations. Like the other corporations, they laid claim to a very early origin. It is well settled that the Emperor Charles IV. gave them a charter and a coat of arms. They met on certain days, and criticized each other's productions, in which external correctness seems to have appeared to them the chief object; few indeed had an idea of the difference between poetical and prosaical ideas or expressions. Their attempts in the lyric style were chiefly limited to spiritual songs; in the epic to rhymed versions of the scriptural narratives. They were also fond of the didactic style. The rules by which the members of the societies were to be guided as to the metre, &c., of their compositions were written on a table, and called *tabulatur*, for the sake of enforcing a strict observance of purity in language and prosody. The chief faults to be avoided were collected; they were thirty-two in number, and distinguished by particular names. He who invented a new metre invented also a new tune, the names of which were the drollest and sometimes the most senseless imaginable. Besides their stated meetings they held public meetings, generally on Sundays, and festivals in the afternoon in churches. In Nürnberg, where the master-singers flourished particularly, such meetings were opened with free-singing, in which anybody might sing, though not belonging to the corporation. In this the choice of the subjects was left comparatively uncontrolled; then followed the chief singing, when only those who belonged to the corporation were allowed to sing, and only on scriptural subjects. The judges were called *Merker*, and sat behind a curtain. There were four: one watched whether the song was according to the text of the Bible, which lay open before him; the second whether the prosody was correct; the third criticized the rhymes; the fourth the tunes. Every fault was marked, and he who had fewest received the prize, a chain with medals. Whoever had won a chain was allowed to take apprentices, to have many of whom was a great honour. Money was never taken from apprentices. After the expiration of his poetical apprenticeship the young poet was admitted to the corporation, and declared a master after having sung for some time with acceptation. These strange societies originated towards the end of the fourteenth century at Mainz, Strasburg, Augsburg, and lasted in several free cities of the empire until the seventeenth, in Nürnberg to the eighteenth century, where probably the renown of Hans Sachs (see SACHS), the famous shoemaker and poet, kept them longer in existence. The last society of the kind was that of Ulm, which was dissolved in 1839. Some of the most famous master-singers were Henry of Meissen, called *Frauenlob*, doctor of theology at Mainz; Master Regenbogen, a smith; Master Hadlaub, and Master Muscatblut.

MASTIC, a resinous substance obtained from incisions made in the branches of the *Pistachia lentiscus*, a small tree, or rather shrub, growing in the Levant and other countries bordering on the Mediterranean. This tree belongs to the natural family Terebinthaceæ. It attains the height of 15 or 20 feet; the leaves are alternate and pinnate; the flowers are small, inconspicuous, disposed in axillary racemes, and are succeeded by an ovoid drupe containing an osseous nut. It forms one of the most important products of Scio, and has been cultivated in this and some of the neighbouring islands from remote antiquity. Heat seems to exercise a great influence on the resinous product. Mastic is consumed in vast quantities throughout the Turkish Empire, and is there used as a masticatory by women of all denominations for the purpose of cleansing the teeth and imparting an agreeable odour to the breath. It was formerly in great repute as a medicine throughout Europe, but at the present time is chiefly used as a varnish for covering maps, prints, drawings, &c. It is also used by dentists for stopping hollow teeth.

MASTICATION. The process of division of the food, effected in the mouth by the combined action of the jaws and teeth, the tongue, palate, and muscles of the cheeks. This process is seen in its typical perfection in the higher Vertebrata only; the lower groups (for example, serpents) swallowing their food with little or no preparatory division; the teeth in the latter instances being more adapted for prehension than for mastication. The act of mastication involves in itself several individual actions, each of a more or less complicated kind. The lower jaw can thus be lowered or depressed to admit food, or raised, so as to bring the teeth together. The oblique or lateral action of the lower jaw is also calculated to bring together the surfaces of the molar or grinding teeth, and those of the incisors or front teeth, so as to perfectly divide the particles of food placed between them. The lower jaw in this latter phase of its action is rotated from side to side, and is at the same time raised and depressed on the upper jaw. The tongue also assists in the masticatory process, by pressing the food against the palate, and placing it between the teeth, besides aiding in the perfect mixing of the food with the salivary fluid. The importance of mastication in the maintenance of health, and in the perfect digestion of the food, cannot be over-estimated. Besides affording the opportunity for the food and saliva to become perfectly mixed, the due performance of mastication and the mere mechanical division of the food is of importance in furthering the perfect action of the stomach, and in presenting that organ with the material for digestion in the proper state of division adapted to its easy solution and digestion. Conversely, it may be stated that imperfect mastication, arising from whatever cause, is a fertile source of the numerous ailments comprehended under the term *indigestion*, a fact due chiefly to the imperfect division of the food. The muscles chiefly concerned in mastication, are the temporal, massetes, two pterygoid, digastric (in part), and mylo-hyoid. These muscles derive their nervous supply from the lesser or non-ganglionic portion of the fifth nerve.

MASTIFF (*Canis villaticus*). The mastiffs are recognized by the large head, the dependent lips, the

ears of large size, and by the general muscularity of the form. The mastiff in general disposition is affectionate and gentle, extremely faithful and vigilant. In Rome and in classical ages these dogs were held in high estimation for their strength and courage. The most valued breeds were obtained from Britain, where officers were appointed to breed them and to transmit them periodically to Rome. The mastiffs fought lions, &c., in the arenas of the Roman amphitheatres, although this does not appear to have been the sole or chief cause of their being held in estimation among the Romans. Manwood, in his work on Forest Laws, says that this variety of dog obtained its popular name from the Saxon *mase theefese*, or 'thief-frightener.'

MASTODON (Greek, *mastos*, breast; *odous*, tooth), an extinct genus of Proboscidea or Elephants, the fossil remains of which first occur in the miocene rocks of the tertiary period, and which persist through the pliocene and post-pliocene epochs also. In general structure the mastodons bear a close resemblance to the existing species of elephants. Their chief peculiarities consist in the dentition and structure of the teeth. They possessed upper tusks, formed by the incisor-teeth as in living elephants; but in addition the mastodons appear to have possessed two lower incisor-teeth also, which were generally tusk-like in proportions, but which did not reach any great development, and usually disappeared when the mature state was reached. The molar or grinding teeth of the mastodons present characters highly distinctive of the genus. These teeth had coarse grinding surfaces divided into 'wedge-shaped transverse ridges, and the summits of these were subdivided into smaller cones more or less resembling the teats of a cow, whence the generic name' (Owen). The miocene mastodons number three species from rocks of that age in India, and four from European miocene strata. The post-pliocene deposits of America contain the remains of a large mastodon, the *M. Ohioticus*. In this latter species the *lower* jaw of the young of both sexes possessed two tusks, which were shed in the females before reaching adult life, whilst one of these lower tusks was retained by the male animals. Both sexes retained the long upper tusks. The geographical range of the mastodons, like that of the mammoth (which see), must have extended over a considerable area. It certainly included North America, Europe, and Asia—one species, the *Mastodon longirostris* (Kaup), having thus inhabited England, Germany, France, and Italy; whilst the remains of other species, as already mentioned, occur in India and elsewhere. In length the mastodons must have attained considerable dimensions. A specimen, almost entire, of the *Mastodon taricensis*, from the pliocene deposits of Piedmont, measured 17 feet from the tusks to the tail; and an American specimen measured 18 feet in length, and 11 feet 5 inches in height. Other well-known species of mastodon include the *M. arvernensis* (Croizet and Jobert); and Dr. Falconer, from a consideration of the arrangement of the characteristic ridges of the molar teeth, has proposed to classify the mastodons into several sections. Those forms in which the teeth possess four transverse ridges are thus classified in the section Tetralophodon, whilst those with teeth exhibiting three ridges are included in the section or genus Trilophodon.

MASULIPATAM, a town of India, in the Presidency of Madras, and 220 miles N.N.E. from the city of that name, on a low flat on the Bay of Bengal, near one of the mouths of the Kistnah. It consists of the pettah or native town, the fort, and the cantonment. In the pettah, which extends about 3 miles, the houses of a better description are built of brick or mud, while those of the poorer classes are wretched huts constructed of bamboo. The fort, situated about 1 mile to the south-east, stands in the middle of a swamp, and is reached from the town by means of a causeway. Within it are the arsenal, and barracks, which have both been allowed to fall into decay since the withdrawal of the garrison in 1865; a Protestant and a Roman Catholic church. Masulipatam is a station of the Church Missionary Society, and there is a Protestant as well as a Roman Catholic church in the pettah. The cantonment, which adjoins the pettah, is about 4½ miles long by 1 mile broad. The manufactures consist chiefly of cotton goods, plain or printed. In 1864 a storm-wave swept over the town, which is said to have destroyed 30,000 lives, and Masulipatam has never since regained its prosperity. Pop. 36,188.

MATAMORAS, a town of Mexico, department of Tamaulipas, on the right bank of the Rio Grande del Norte, about 10 miles above its mouth in the Gulf of Mexico. It consists of houses mostly built of brick; the streets are unpaved, except on the sides, where there is a brick pavement for foot passengers. The best part is the public square; here stand the church, the town-house, and the custom-house, with a number of elegant private dwellings. Matamoras being surrounded by lagoons and the Rio Grande is liable to be flooded in the rainy season. Agriculture and the rearing of horses and cattle are the chief occupations. Pop. about 12,600.

MATANZAS, a seaport on the north-west coast of Cuba, 52 miles east of Havana. It is situated on a bay of the same name, which affords one of the largest, safest, and most convenient harbours in America, having a good castle for its defence. It has considerable commerce, exporting sugar, molasses, and coffee, and ranking in importance next to Havana. It communicates by railway with the interior of the island. Pop. about 40,000.

MATAPAN, CAPE (anciently *Tænarum Promontorium*), the most southern extremity of the Morea, Greece, and of the European continent; lat. 36° 21′ 30″ N.; lon. 22° 28′ E. It terminates in a high, steep, pyramidal point, at the base of which is a cavern apparently blackened by the fires of former volcanoes. Upon its summit are the ruins of an ancient temple supposed to have been dedicated to Poseidon.

MATARO, a town of Spain, in Catalonia, on the Mediterranean, 19 miles north-east of Barcelona. It consists of two portions—an old, built on a declivity, with narrow and inconvenient streets, and a modern, extending along the shore, and consisting of several spacious streets and handsome squares. The principal edifices are a fine church, a college, town-house, court-house, two convents, a theatre, and hospital. The manufactures are chiefly linen, cotton, and woollen goods, soap, leather, earthenware, hardware, and articles in esparto; and the trade, including these, and fish, wine, brandy, timber, fruit, &c., is important. Pop. 17,405.

MATCHES, in the most common sense of the term, are splints or strips of inflammable material, usually wood, one end of which is dipped into a composition that ignites by friction or other means. One of the first forms of this article was the brimstone match, which was a thin strip of resinous or dry pinewood with pointed ends dipped in sulphur, which were ignited by the fire obtained from striking sparks into tinder with a flint and steel. These matches were commonly used till nearly thirty years into the present century. The oxymuriate matches, which were popular for a time, were made by tipping the small pieces of wood with chlorate or oxymuriate of potash mixed into a paste with gum and vermilion. When the tipped end was dipped into a bottle con-

taining a bit of asbestos moistened with sulphuric acid the match took fire. The lucifer-match succeeded this in 1827 and soon became very popular. The bottle of sulphuric acid was now dispensed with; the inflammable substance was a mixture of chlorate of potash and sulphide of antimony, with enough of gum to render it adhesive when mixed with water, and applied to the end of the match, which had been previously dipped into melted sulphur. The matches were ignited by being drawn smartly through a piece of folded sand-paper. This was succeeded after a few years by the Congreve match, in which phosphorus was substituted for the sulphide of antimony. Many improvements have since been made both in the composition of the igniting materials and in the processes of manufacture. In many of the British match factories the process is briefly as follows. The timber (preferably fine-grained white or yellow pine) is cut into blocks of about 15 inches in length and stripped of its bark. The blocks are then fixed in a kind of lathe and made to revolve; a fixed cutting tool, acting along the whole length of the block cuts off a continuous strip of veneer the thickness of the match, while at the same time a set of small knives cut the veneer into seven separate bands. These are broken into pieces of about six feet long and are subjected to the action of a machine which chops them into splints the size of the match. The splints are arranged in a frame (which may contain about 2000), and their projecting ends are dipped into a shallow pan containing either melted sulphur (now generally disused owing to its offensive smell) or paraffin (now the most common material). The splints are next dipped into another shallow pan containing the igniting composition, which consists essentially of an emulsion of phosphorus in a solution of gum or glue, combined with a quantity of chlorate of potash, red-lead, or nitrate of lead, to increase the combustibility, and some colouring matter, as cinnabar, smalt, &c. The frames are then placed in a heated compartment, where they remain till the igniting tips are dried, when the matches are taken out, counted, and packed into boxes. In some large factories from 6,000,000 to 9,000,000 matches are produced daily.

The use of common phosphorus as the chief ingredient of the igniting composition has serious disadvantages. Phosphorus is highly poisonous, and its general dissemination has led to many accidental deaths and even to wilful poisoning. The operatives, too, who are exposed to the phosphoric fumes during the process of manufacture, are subject to an insidious disease (necrosis) which frequently proves fatal. It commences with toothache, the teeth decay and fall out, then the decay extends to the jaw, causing excruciating pain, from which the sufferer is relieved only by a surgical operation or death. Fortunately all risks whatever may be avoided by the use of amorphous phosphorus, which is an efficient substitute, and entirely innocuous.

Safety-matches, invented in Sweden in 1855, have been introduced into this country and patented by Bryant and May. In the ordinary match all the igniting composition is put on the splint, and the match may be lighted by friction on any rough surface; in the safety-match the composition is divided between the splint and the friction paper attached to the box, so that the match can only be lighted in ordinary circumstances by being rubbed on the prepared paper. The compound put on the splints consists of chlorate and bichromate of potash, red-lead, and sulphide of antimony, while the friction paper is coated with a mixture of amorphous phosphorus and sulphide of antimony.—*Vestas* are a kind of matches made of a wick of fine cotton threads coated with stearine and paraffin, smoothed and rounded by being drawn through a metal plate pierced with circular holes of the desired size; the wick is then cut into vesta lengths, which are tipped with the ordinary igniting composition. *Fusees* are made of a thick spongy paper soaked in a solution of nitre and bichromate of potash, and tipped with the usual ingredients. *Vesuvians* are round splints having a large head at each end, which is made by repeated dipping in a mixture of charcoal, nitre, some scented bark, ground glass, and gum, and are also tipped with the ordinary igniting composition.

MATE, in the mercantile navy, is the officer who acts as the deputy of the master, taking his place during his absence. They are of four grades—first, second, third, and fourth mate; small ships carry often but one or two at most; large and well-found vessels carry three or four. The junior mate has usually the superintendence of the stowing of the vessel. The law recognizes only two classes of persons in charge of a trading vessel—the master and the mariners, the mates being included in the latter. Certificates of competency in each of the grades are granted by the local marine boards of the various British ports upon the applicant passing a satisfactory examination. These may be cancelled or suspended if the holder has been found guilty of gross negligence, misconduct, or has given proofs of incompetence. In the royal navy the term mate is now limited to the assistants of certain warrant officers, as boatswain's mate, gunner's mate, &c.

MATÉ, the South American name of the *Ilex Paraguayensis*, a kind of holly, natural order Aquifoliaceæ. It has smooth, ovate-lanceolate, unequally serrated leaves, much branched racemes of flowers, the subdivisions of which are somewhat unbellate. This production of Brazil and other parts of South America is extensively used as a substitute for tea throughout these countries. Its use as an article of food is of ancient origin; it was found to be general among the natives when the Portuguese conquered Brazil, and has become a fashionable beverage amongst the European settlers all over the South American continent. The leaves are prepared by drying and roasting; large branches are cut off from the plants and placed upon hurdles over a wood fire until sufficiently roasted; the branches are then placed on a hard floor and beaten with sticks; the dried leaves are thus knocked off and then reduced to powder. Maté is drunk at every hour of the day. It has acquired this name from the gourd or calabash in which the leaves are infused. Boiling water is poured upon the powdered leaves, then a lump of burned sugar and sometimes a few drops of lemon juice are added. The infusion is sucked through a tube, sometimes of silver, open at one end, and having a perforated bulb to act as a strainer at the other. The maté-bowl is passed from hand to hand, and often serves an entire party. It has an agreeable, slightly aromatic odour, is rather bitter and restorative, and very refreshing. It acts as a slight aperient and diuretic, and if too largely indulged in debilitates the nervous system. It contains theine, the active principle of tea and coffee. The plant, which is a shrub or small tree, grows wild, and permission to gather the leaves is granted by the Paraguayan and Brazilian governments to certain merchants for a considerable payment. Some years ago the quantity exported from Paraguay alone amounted to over 5,000,000 lbs. annually. It is sent, however, only to other parts of South America, its use being as yet confined to that continent.

MATERA, a town of Italy, Naples, province of Potenza, capital of the district of its own name, on the right bank of the Gravina, 35 miles W.N.W. of Taranto. It is a place of great antiquity, the resid-

since [illegible] seat of a [illegible] and has a [illegible], three [illegible], and a [illegible] school of [illegible] medicine, law, and [illegible]. There are manufactures of leather and [illegible], and a trade in [illegible] and agricultural produce. Pop. 11,000.

MATERIALISM, in philosophy, that system which denies the existence of a spiritual or immaterial principle in man, called the mind or soul, distinct from matter; or in a more extended sense, that which denies that is founded on the supposition that all existence may be resolved into a modification of matter, including, of course, the conscious subject. As held by the ancient philosophers Democritus and his later disciples Epicurus and his sect, and though in a somewhat different sense, by the modern, materialism is equivalent to atheism, as it recognizes no Divine Creator, no place of future rewards or punishments, and no immaterial principle in man. Tertullian contending against the excessive spiritualizing tendencies of the Platonic schools maintained that the scriptures taught that the soul was corporeal and had a beginning; the Deity, he also held, had a body. The system of Hartley admits the existence of a soul, but seems to imply materialism as it attempts to explain mental phenomena physically, or by movements arising out of the bodily organization. Dr. Priestley has more formally than any other writer enunciated the principles of materialism in the pure and proper sense of the term. He denies the existence of a separate immaterial principle in man, called the mind or soul, which he thinks could not exist in union with the material body; he thinks, further, that all mental phenomena may be explained by means of supposed movements arising out of the physical organization. Adopting Hartley's hypothesis of medullary vibrations, he defines mental phenomena as medullary vibrations perceived; and he contends, principally from the analogy of brutes, that physical organization is adequate to produce perception. But, while denying the existence of a soul, he does not deny the immortality of man, a future state of rewards and punishments, nor the existence of a God. Hobbes goes further than Priestley, as he denies in one part of his works the existence of spiritual beings; yet he makes God the foundation of moral and political science. There being nothing, in his opinion, but matter in the universe, it follows that God is matter. All systems of materialism rest too much upon hypothesis and conjecture. When we go beyond what are called the qualities of the mind, or of matter either, and speculate as to what it is in itself, whether it is something else or differs from that something, whether it has or has not existence, we are landed in the regions of pure conjecture. The utmost we can admit from the whole tenor of modern investigation is that mind and matter are inseparably united within the sphere of the animal kingdom. Observation and experience prove that the conscious life of every individual on earth is dependent on his organization and its history; but it is impossible to resolve mind into matter.

MATERIA MEDICA, the collective name given to the materials with which physicians attempt to cure or alleviate the numerous diseases of the human body, and which comprehend a great variety of substances taken from the mineral, animal, and vegetable kingdoms—such as silver, copper, bismuth, mercury, lead, iron, antimony, tin, arsenic, and zinc, from amongst the metallic bodies; sulphur, lime, soda, nitre, magnesia, borax, and several salts, from amongst the other minerals; and nearly 900 substances belonging to the animal and vegetable kingdoms. All these articles are susceptible of an infinite number of combinations, and upon the [illegible] promptitude with which these are made and applied hinges the whole system of the practice of physic. In early times the articles of the materia medica were still more numerous and complex than at present; but as many substances were then employed from fanciful and superstitious motives, modern physicians have discarded these and adopted a few others much more valuable and certain in their effects. Thus in ancient times neither antimony, quinine, jalap, ipecacuanha, nor sarsaparilla were known to exist; but the progress of chemistry and the discovery of America have put us in possession of these medicines, which have proved of the greatest value to mankind. Antimony, when formed into James's powder, and quinine, have preserved many thousands of lives annually from fevers. Jalap is a most efficacious purgative, and ipecacuanha is by far the best and safest emetic which has been yet discovered. To chemistry also mankind are indebted for many valuable additions, such as the preparations of mercury, and the knowledge of the efficacy of acid gases in the destruction of the powers of contagion. The spirit of commerce, too, has added its share to the stock of valuable drugs. Egypt sends us senna, borax, and opium; Russia, rhubarb; from India we derive cinnamon, cloves, cajeput, ginger, camboge, &c.; while from South America and the West Indies we import many of the most active vegetables employed in medicine. The exact mode in which medicines act upon the human body is still, in the vast majority of cases, a subject of great obscurity. That they have certain effects, and that these effects are pretty constant, we see, but little or nothing is known of the reason why the particular effects are produced.

MATHEMATICS is the science in which known relations between magnitudes are subjected to certain processes which enable other relations to be deduced. Mathematical principles which are deduced from axioms with the help of certain definitions belong to *pure* mathematics, and those which have been deduced with the help of pure mathematics from certain simple physical laws (see LAW, PHYSICAL), belong to *mixed* mathematics. Arithmetic, Euclid, modern geometry, algebra, trigonometry, co-ordinate geometry, the differential and integral calculus, kinematics, quaternions, the calculus of finite differences, &c., are departments of pure mathematics; the dynamics of rigid bodies and the application of its principles in *astronomy* and in investigating the actions of forces on ordinary matter, acoustics, the undulatory theory of light, optics, thermodynamics, electricity and magnetism, &c., are departments of mixed mathematics. An axiom is a principle the truth of which is evident to any person who understands the language in which it is expressed. That certain principles are axiomatic is most likely due to the transmitted experience of mankind, for man must always have been testing, consciously or unconsciously, the simple and complicated logical consequences of these principles. The sciences of arithmetic and geometry are logical developments of axioms and definitions regarding number and the representation of number and of straight lines and circles in space. The expression of any quantity involves two ideas, a number and the value of a unit. (See UNITS.) *Arithmetic* treats of number; it deals chiefly with the employment of systems of numeration and notation and the processes of addition, subtraction, multiplication, and division. Some of the principles of arithmetic are merely translations into the language of numbers of certain algebraic and geometric principles, such as proportion, the extraction of roots, &c. Indeed, it is found that not only arithmetic, but every section of mathematics, gains considerably in power when it makes use of the principles of other sections. Arithmetic as taught in

modern schools treats not merely of numbers but of quantities, for in the well-known reduction and 'compound' rules and in the applications (called practice, interest, discount, stocks, &c.) of the principle of proportion, quantities of matter, space, time, money, &c., and not merely numbers, are subjected to processes. Geometry and trigonometry established the relations of the lengths of straight and curved lines, the areas of plane and curved surfaces, and the volumes of mathematical figures; the arithmetical adoption of these relations is called *mensuration* (which see). The *geometry* of ancient philosophers has been transmitted to us by Euclid; many of Euclid's demonstrations are set aside in modern treatises, being now regarded as axiomatic; others are much more easily effected by algebraic and trigonometric methods. The new science of *modern geometry* (see M'Dowell's Elementary Treatise) is a development of Carnot's theorems regarding transversals; its laws of generalization enable us to attack the most difficult problems in geometry. But the power of modern geometry is eclipsed by that of Hamilton's *quaternions* (which see), for the method of this new science seems to comprehend all others in mathematics, while it is of extraordinary simplicity.

The principles of algebra are deduced from arithmetic and from certain definitions. Numbers, and the arithmetical processes to which they are subjected, are indicated by symbols; thus $a + b$, $a - b$, $a \times b$ or $a \cdot b$ or simply ab, $a \div b$ or $a : b$ or $\frac{a}{b}$, indicate respectively that a number represented by the letter b is added to, subtracted from, multiplied into, or is the divisor of the number represented by the letter a.

Each of the algebraic expressions a^2, a^{-1}, a^n, $a^{\frac{p}{q}}$, log. a, signifies that the magnitude represented by the letter a is subjected to a certain process. The symbol = indicates that the expression on one side of it is equal to the expression on the other; the connection of two expressions by this symbol is called an *equation*. When the relation existing among a number of magnitudes is known, it may generally be stated in the form of an algebraic equation. The equation is said to be solved for any particular magnitude when the value of this magnitude is found in terms of the others—that is, as an algebraic combination of the others. Equations containing only the first power of the magnitude whose value in terms of the others is required are called simple equations, or equations of the first degree; containing no higher power of the unknown magnitude than the second, they are quadratic equations, or equations of the second degree; and generally the degree of the equation is that of the highest power of the unknown quantity. When there are two equations connecting a number of quantities, the values of two of the quantities may generally be found in terms of all the others; and generally if there are n such simultaneous equations, the value of n of the quantities may generally be found in terms of all the others. When from two simultaneous equations a third is deduced, in which one of the quantities does not appear, this quantity is said to have been *eliminated*. The solutions of equations, the results of elimination, &c., must be reduced to their simplest forms; the object of a great many algebraic processes is the simplification of expressions. Equations higher than the second order are dealt with by processes which may be found described in treatises on higher algebra. (See Todhunter's Theory of Equations; see Salmon's Higher Algebra, in which students may enter on the method of invariants.) The solution of an equation is often expressed in the form of a *determinant*, a conventional arrangement of quantities which indicates the sum of a certain number of different products of them. The determinants—

$$\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} \quad \text{and} \quad \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

mean $a_1b_2 - a_2b_1$ and $a_1(b_2c_3 - b_3c_2) + a_2(b_3c_1 - b_1c_3) + a_3(b_1c_2 - b_2c_1)$ respectively. Euclid's definition of ratio (which see) may be shown to agree with the algebraic definition, in which it is represented by a quotient; thus proportion (which see) is simply the equation of two quotients. When the ratio between the values of two varying quantities is constant, one of them is said to vary with the other; thus if $\frac{x}{y} = k$ where x and y are varying quantities and k is a constant, $x = ky$, or as it is usually expressed, $x \propto y$. (See VARIATION.) When two quantities susceptible of change are so connected that if we alter one of them there is a consequent alteration in the other, this second quantity is called a function of the first. Thus if different numerical values may be assigned to x, then the expressions x^2, $(1 + x)^3$, 5^x, log. x, and sin x are all functions of x. Expanding functions into the sum of a series of many simpler functions is often of considerable importance in mathematics. Many functions of x may be expanded into series of the form $A + Bx + Cx^2 + Dx^3 + $ &c. (where A, B, &c., are constants), by a process termed the method of indeterminate coefficients. In the binomial theorem the nth power of a binomial (an expression consisting of two terms connected by + or −) is expanded into a series; it is as follows: $(a+b)^n = a^n + n\,a^{n-1}\,b + \frac{n\,(n-1)}{1\cdot 2}\,a^{n-2}\,b^2 + $ &c. $+ \frac{n\,(n-1)}{1\cdot 2}\,a^2\,b^{n-2} + n\,a\,b^{n-1} + b^n$, where a and b are any algebraic quantities whatever, and where n is any number, positive or negative. The form of the rth term of the series is evidently $\frac{n\,(n-1)\,(n-2)\ldots\ldots(n-r+2)}{1\cdot 2\cdot 3\ldots\ldots(r-1)}\cdot a^{n-r+1}\,b^{r-1}$. This is merely a particular form of Taylor's theorem of the differential calculus. The multinomial theorem is a similar expansion of $(a + b + c +$ &c.$)^n$. The calculation of logarithms depends on an application of the binomial theorem. Other processes and divisions of algebra are the summing of arithmetic, geometric, harmonic, and other regular series; the use of continued fractions (expressions of the form $\cfrac{1}{a + \cfrac{1}{b +}}$ &c.); calculating the possible number of permutations and combinations of a given number of things; the signification of imaginary expressions (involving $\sqrt{-1}$, see also QUATERNIONS); the theory of numbers; the theory of probability; the calculation of interest, discount, annuities, life assurances, &c.

Trigonometry defines methods of measuring angles; it introduces the notion of a limit (which see) into mathematics; from its definitions a body of powerful mathematical laws and principles are deduced. Angles are measured in degrees (which see) and in circular measure. When a circle is described about the vertex of an angle, the length of the arc intercepted between the two straight lines divided by the radius of the circle is called the circular measure of the angle. The unit angle in circular measure is the angle at the centre of a circle subtended by an arc equal in length to the radius. Angles may be compared by means of certain functions which we proceed to define: Let the angle be an acute angle A in any right-angled triangle A B C where C is the right angle; then

Sin A or the sine of A is $\frac{BC}{AB}$

Cos A or the cosine of A is $\frac{AC}{AB}$

Tan A or the tangent of A is $\frac{BC}{AC}$

Cot A or the cotangent of A is $\frac{AC}{BC}$

Sec A or the secant of A is $\frac{AB}{AC}$

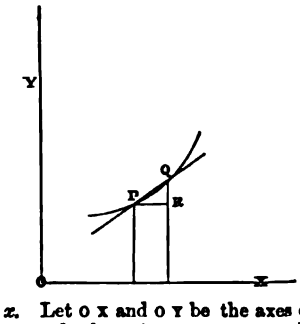
Cosec A or the cosecant of A is $\frac{AB}{BC}$

For any given angle the above functions are shown to be always the same. We see from these definitions that *sin* A = *cos* B, and therefore sin A = cos (90° − A), and similarly, tan A = cot (90 − A), sec A = cosec (90 − A). Again sin A and cosec A are reciprocals of one another, as are cos A and sec A, tan A and cot A. Also $(\sin A)^2 + (\cos A)^2 = 1$. The extended definition of *sin* A, &c., when A may have any value greater or less than a right angle, the signification of negative angles, &c., will be found in treatises on trigonometry. The trigonometric functions of an angle which is the sum or difference of two or more angles may be expressed in terms of the functions of the separate angles, and some of these relations greatly facilitate the simplification of mathematical expressions. Trigonometry further deals with the relations of the sides, angles, and areas of triangles and other mathematical figures; the expansion of certain functions into series, &c.

Spherical Trigonometry deals with the triangles formed on the surface of a sphere by the intersection of great circles of the sphere, just as plane trigonometry deals with plane triangles. The arcs of great circles forming the sides of a spherical triangle really represent the angles which the radii of the sphere to the corners of the triangle make with one another, and hence the formulæ of spherical triangles involve the sines, cosines, &c., of the sides as well as of the angles. Spherical trigonometry is applied in many departments of solid geometry; it is of great importance in navigation (See Todhunter's treatises on Trigonometry).

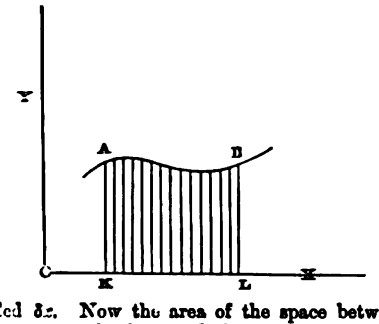
Analytical or *Co-ordinate Geometry* is deduced by the principles of Euclid, algebra, and trigonometry from a defined method of indicating the position of a point. When two lines, called the co-ordinate axes, are drawn at right angles to one another, the position of any point in the plane of the axes is known when its two perpendicular distances from the axes are known; one of these distances is called the x co-ordinate, the other the y co-ordinate of the point. If a straight line be drawn anywhere in the plane of the axes, it may be shown that the x and y of every point in the line satisfy a certain relation of the form $Ax + By + C = 0$, where A, B and C are certain constant coefficients, positive or negative. This relation is called the equation of the straight line. The equation of a straight line is always of the first degree in x and y. The co-ordinates of every point in any particular mathematical curve are found to satisfy a particular algebraic relation which is called the equation of the curve in question. The curves called conic sections (the circle, ellipse, hyperbola, and parabola) have equations of the second degree in x and y; they are called curves of the second degree; curves of the third, fourth, and higher degrees are those which have equations of the third, fourth, and higher degrees in x and y. The position of a point may be defined in another way than by x and y co-ordinates. Let there be a fixed line O X in a certain plane, and let a point O in this line be called 'the origin,' now the position of any point P in the plane is quite definite if the distance O P is known, and the angle X O P. These are called the 'polar co-ordinates' of P. The distance O P is called the 'radius vector' of P, it is generally indicated in mathematics by the letter r; the angle X O P is indicated by the letter θ. It is evident that the equation of a straight line or curve instead of involving x and y may involve r and θ. When we are concerned with points not restricted to one plane, instead of the two co-ordinate axes we employ three planes at right angles to one another; the co-ordinates of a point are its three perpendicular distances (designated by the letters x, y, and z) from these planes. The equation to any surface is a relation which is true for the x, y, and z of every point in the surface. An equation of the first degree in x, y, and z, may be shown to represent a plane; an equation of the second degree represents what has been called 'a quadric,' which is a surface such that every section of it by a plane is a conic section. The simplest quadric is a sphere. In this system a curve is indicated by two simultaneous equations; in fact, as a curve may be regarded as the intersection of two certain surfaces, the equations of these surfaces are given to define the curve. In the 'polar' method of defining the position of a point P in space a fixed plane and a line in it O X are employed for reference; then the distance O P (called r), the angle (called θ) between O P and the fixed plane, and the angle (called ϕ) between O X and the projection of O P on the fixed plane are the 'polar co-ordinates' of P. Any equation involving x, y, and z may be transformed into a polar equation. (See Salmon's Conic Sections and his Co-ordinate Geometry of Three Dimensions. Todhunter's Co-ordinate Geometry is a more elementary treatise.)

The *Differential Calculus* is founded on the idea of a limit as enunciated in the definition of a 'differential coefficient.' If y is a function of x (see above), the differential coefficient of y with respect to x, for a particular value of x, is the rate of alteration of y with x. It is usually indicated by the symbol $\frac{dy}{dx}$. For any given value of x we can find the value of y; now let x be slightly increased in value, and the corresponding value of y found; the ratio of the increment of y to the increment of x becomes in the limit, as the increments are supposed to be smaller and smaller, the differential coefficient of y with respect to x. Let O X and O Y be the axes of co-ordinates; let P and Q be points very near each other in a curve; now the ratio of the increment of y from P to Q to the increment of x, is tan Q P R. But as Q is supposed to be nearer and nearer P, the direction of P Q becomes more and more nearly the direction of the tangent at P, and hence $\frac{dy}{dx} = \tan\theta$ if θ is the angle made by the tangent of a curve with the axis O X. If at any point in a curve $\frac{dy}{dx} = 0$ it is evident that the value of y is there either a maxi-



mum or a minimum, and an examination of the curve (by means of its equation) in the neighbourhood of the point will settle whether y has a maximum or a minimum value. Readers will perceive that the differential coefficient of a function of x with respect to x is of great power in showing the shape of a curve whose equation is given; it enables calculations to be made respecting tangents, normals, asymptotes, radii of curvature, evolutes and involutes of curves, and enables the form of any function of a variable to be known for every value of the variable. The differential coefficient (indicated by the symbol $\frac{d^2y}{dx^2}$) of $\frac{dy}{dx}$ with respect to x is called the second differential coefficient of y with respect to x; the nth differential coefficient of y with respect to x is indicated by the symbol $\frac{d^n y}{dy^n}$. When the value of y is known in terms of x we are able to express the values of these successive differential coefficients in terms of x, by employing certain methods of the differential calculus. 'Taylor's Theorem' enables a function of $x+h$ to be expressed as the same function of x together with the sum of a series, each term of which contains a power of h and a differential coefficient of the function of x with respect to x: it has many important applications in higher mathematics. Maclaurin's theorem is a simplified form of Taylor's, it is much employed in expanding functions in series; by means of it many of the expansions which are effected laboriously in trigonometry with the help of Demoivre's theorem, may be written out at once. The theorems of Lagrange and Laplace are developments of that of Taylor.

In the *Integral Calculus* the process of differentiation is reversed. Let A B be a curve; let a great number of equidistant perpendiculars be let fall from A B upon O X; let their common distance asunder



be called δx. Now the area of the space between any two perpendiculars and the curve and O X is nearly equal to one of the two perpendiculars multiplied by δx, and more and more nearly as δx is smaller; thus if δx is very small the whole area A B L K is nearly equal to the sum of a great number of terms of the form $y \,.\, \delta x$. As δx becomes smaller and smaller the number of terms becomes greater and greater. When δx is supposed to get infinitely small it is called the differential of x, and is indicated by the symbol dx. The whole area is regarded as the sum of an infinite number of terms of the form $y \,.\, dx$. This sum is called the integral of $y \,.\, dx$ between the limits $x = \text{O L}$ and $x = \text{O K}$, and it is written in the form

$$\int_{\text{O K}}^{\text{O L}} y\,dx$$

Now it may be proved that if y is the differential coefficient of any function of x (say $f(x)$) with respect to x, the above series is equal to $f(\text{O K}) - f(\text{O K})$. In applying this principle there is often great difficulty in finding of what function y is the differential coefficient, and there are many expedients which may have to be adopted in reducing y to the form of a known differential coefficient. Some of the common applications of the calculus are the determinations of areas and volumes of mathematical figures; readers are referred for a knowledge of these and of its application in the solution of differential equations to Todhunter's Differential and Integral Calculus, and Boole's Differential Equations.

Kinematics is a department of pure mathematics; it treats of the motions of bodies without reference to the forces which have caused motion. In any motion of a point 'the velocity' or rate of change of position with time is evidently $\frac{ds}{dt}$ (see above), where s is distance measured along the point's path. The rate of change of velocity in the direction of motion with time is evidently $\frac{d^2s}{dt^2}$, and this is called 'the acceleration' in the direction of motion. There is always another acceleration when the body moves in a curved path, for the direction of the velocity is always changing; this acceleration is evidently at right angles to the path; its amount may be shown to be $\frac{v^2}{\rho}$, where v is the velocity in the direction of motion, and ρ is the radius of curvature of the path. The 'Hodograph' of the motion of a body is such that its radii vectores are at every instant parallel to, and represent by their length the amount of the velocity of the moving body. It is easily proved that velocity in the hodograph exactly represents in magnitude and direction the acceleration of velocity in the real path at any instant. Kinematics is founded on an axiom called 'the parallelogram of velocities.' For an investigation by elementary mathematics see Thomson & Tait's Elements of Natural Philosophy.

Mixed Mathematics is the application of mathematics to physics. When observation and experiment have suggested the causes of phenomena, physicists observe accurately the conditions of the phenomena to determine a quantitative law. From this law a vast body of relations may generally be deduced by means of mathematics. The disagreement or agreement of any of the deduced laws with experiment and observation is evidence of the fallacy or correctness of the original statement. It is obvious that every mathematical deduction from two or more simple laws must be proved by experiment and observation before it can be received with confidence. (See PHYSICAL LAW.) The principles of the *dynamics* of a rigid body may be deduced by mathematics from Newton's laws of motion. These laws were first suggested by observation; the exact observation of astronomers and physicists has confirmed our belief in their truth, and in the truth of the laws deduced from them. (See Tait & Steel's Dynamics, Todhunter's Statics, Routh's Rigid Dynamics. For the application of the principles of dynamics to ordinary matter, solid, liquid, and gaseous, readers are referred to Thomson & Tait's Natural Philosophy, Besant's Hydrostatics, Rankine's Manuals, and Treatises on Sound by Donkin and Airy.) Certain experiments on *light* gave Young the notion of investigating light phenomena on mechanical principles; the truth of the deductions from Young's idea has been fully corroborated by numerous experiments. (See treatises by Verdet, Airy, Fresnel (by Aldis), and others.) The mathematical development of the experimental laws of reflection and refraction of light is called *optics*. (See treatises by Parkinson

and others.) Thomson, Clausius, Clerk Maxwell, and others, have created the modern science of *thermodynamics*, by applying mathematics to the experimental results of Davy, Rumford Mayer, Joule, and Thomson. (See treatises by Tait, Clerk Maxwell, and Rankine.) By the application of the principles of thermodynamics, and of mathematics generally, to the experimental electrical and magnetic laws of Coulomb, Oersted, Ohm, and Faraday, a new science has been created within the last twenty years. The energy displayed in this department of mixed mathemathics is in part due to the great development of electric telegraphy. One of the best examples of the employment of mathematics in physics is afforded by Clerk Maxwell's recent investigation of Faraday's idea that electro-magnetic induction is a mechanical action. The best books on electricity and magnetism are those by Sir William Thomson and Professor Clerk Maxwell.

In this article we cannot enter into a description of modern mathematical methods of investigation; their nature in many special cases is sketched in separate articles. For the history and particulars regarding the various branches of mathematical science readers are referred to the articles ARITHMETIC, ALGEBRA, GEOMETRY, TRIGONOMETRY, CALCULUS, QUATERNIONS, UNDULATORY THEORY of Light, THERMODYNAMICS, POTENTIAL, &c.

MATHER, COTTON, D.D., the eldest son of Increase, rivalled or surpassed his father in learning, influence, and the variety and multitude of his productions. It is recorded in his diary that in one year he preached seventy-two sermons, kept sixty fasts and twenty vigils, and wrote fourteen books His publications amount to 382, some of them being of huge dimensions. His reading was prodigious, his research exceedingly diversified and curious. He was born in Boston, Feb. 12, 1663, and graduated at Harvard College in 1678. In 1684 he was ordained minister of the North Church in Boston, as colleague of his father. He strove to maintain the ascendency which had formerly belonged to the New England clergy in civil affairs, but which was then on the decline. It is, however, in connection with proceedings concerning witchcraft that he is now most generally known. In 1685 he published his Memorable Providences relating to Witchcraft and Possessions, narrating cases which had occurred at intervals in several places in the country, which was used as an authority in the persecution and condemnation of the nineteen unfortunate victims who were burned for witchcraft at Salem in 1692. When the popular reaction against this persecution followed he vainly attempted to arrest it, and never seems to have regretted his encouragement of the shedding of innocent blood, though he admits that some had gone too far. He died in 1728 with the reputation of having been the greatest scholar and author that America had then produced. Credulity, pedantry, quaintness, eccentricity are blended in most of his works with great erudition and instructive details of history and opinion. He was a fellow of the Royal Society of London. His largest and most celebrated work is his Magnalia Christi Americana, or the Ecclesiastical History of New England from 1625 to 1698, in 7 books, folio. His Life was written by his son and successor, Samuel Mather, D.D., also a learned divine and author.

MATHER, INCREASE, D.D., one of the early presidents of Harvard College, was born at Dorchester, Massachusetts, June 21, 1639, and graduated at Harvard in 1656. He was ordained a minister of the gospel in 1661, but had preached before with great success at the North Church in Boston. In June, 1685, he was called to preside over Harvard College, which he continued to do until 1701. His learning, zeal, and general abilities were of great utility to the institution. He distinguished himself also as a very skilful and efficient political servant of the commonwealth. When King Charles II. signified his wish that the charter of Massachusetts should be resigned into his hands, in 1683, Dr. Mather contended against a compliance. In 1688 he was deputed to England, as agent of the province, to procure redress of grievances. He held conferences with King James on the situation of the province, and when William and Mary ascended the throne urged his suit with them in audiences and by memorials. In 1692 he returned to Boston with a new charter from the crown, which some of his old friends condemned; but the general court accepted it, with public thanks to the reverend agent for the industry and ability with which he conducted his negotiations for settling the government of the province. He died at Boston, August 23, 1723, having been a preacher sixty-six years. He is said to have commonly spent sixteen hours a day in his study, and his sermons and other publications were proportionably numerous. During the witchcraft persecution, which he laboured to mitigate, he wrote a book to prove that the devil might appear in the shape of an innocent man, and by this means enabled a number of persons convicted of witchcraft to escape the execution of the sentence of death.

MATHEW, REV. THEOBALD, popularly known as *Father Mathew*, the Irish apostle of temperance, was the son of an illegitimate branch of the Llandaff family, and born at Thomastown, Tipperary, on 10th October, 1790. Through the kindness of the Countess of Llandaff and Lady Elizabeth Mathew he was enabled to study at Maynooth, and was ordained a priest in 1814. Shortly afterwards he was appointed to a missionary charge at Cork, and in that capacity exerted himself with great success in establishing a society, on the model of those of St. Vincent de Paul, for visiting the sick and distressed. A more extended undertaking was the celebrated temperance crusade, on which he entered and laboured with such astonishing results that in a few months he had 150,000 converts in Cork alone, and in the course of a progress through Ireland gained over myriads to sobriety. He afterwards visited London and the principal towns of England, and so highly were his philanthropic labours appreciated that a pension of £300 was ultimately bestowed on him by her majesty from the civil list. For some years previous to his death, which took place on 8th December, 1856, he was incapacitated by failing health from active exertion.

MATHEWS, CHARLES, an eminent comedian, was born in London, 28th June, 1776, and was educated at Merchant Tailors' School. At the age of fourteen he became apprentice to his father, who was a bookseller in the Strand. A strong and early inclination for the stage, however, induced young Mathews, much against his father's inclination, to make his début, after two or three attempts in private, at the Richmond Theatre—singularly enough in the character of Richard III.—in 1793. After ten years' acting in the provinces he made his first appearance before a London audience at the Haymarket Theatre on the 15th of May, 1803. He transferred his services in the September of the following year to Drury Lane, where he played till the theatre was burned down in 1809. After fulfilling successful engagements at the Lyceum, Haymarket, Covent Garden, and provincial theatres he instituted, in 1818, a species of entertainment in the form of a monologue, which, under the title Mathews at Home, proved very successful. For five successive seasons he drew crowded audiences to the English Opera House, where, by his comic songs, recitations, anecdotes of personal

adventure, and imitations of celebrated actors, he greatly enhanced his reputation. In 1822 he was induced, on the pressing invitations of American managers, to cross the Atlantic, and appeared, 6th September, at New York, where he was enthusiastically received. On his return to England in 1823 he produced his Trip to America, which was as favourably received as his At Home. He continued both entertainments for upwards of ten years longer, appearing at intervals in the regular drama. In 1834 he again visited America, and performed his Trip to delighted audiences. He became very ill on the return voyage, and died on his fifty-ninth birth-day, 28th June, 1835, at Plymouth, where he was buried. His powers of mimicry, in which he has never been surpassed by any modern actor, combined with an expressive countenance, a flexible voice and keen discernment, gave him a high position on the English stage. In private life he was universally respected, possessing the friendship of Coleridge, Lamb, and many other eminent men. His son Charles James (born 1803, died 1878) long held a prominent place as a light comedian. Originally intended for an architect, his strong dramatic instinct led him to abandon that profession, and he made his first appearance on the stage at the Adelphi, London, in 1835. In his sixty-sixth year he made a tour of the world, gaining everywhere great applause for the easy grace of his manner, his imperturbable gravity in the most comical situations, and his illimitable powers of mimicry.

MATLOCK, a town of England, Derbyshire, on the Derwent, 17 miles north-west of Derby. There are cotton, flour, and paper mills, and the lead-mines in the neighbourhood employ a number of the inhabitants. Pop. (1881), 4396. The village of Matlock-Bath, about a mile and a half distant, situated in a beautiful vale, is a much-frequented watering-place, its medicinal springs (mean temperature 68° Fahr.) being efficacious in bilious and rheumatic cases, gout, incipient consumption, and muscular debility. At Matlock Bank, a little to the north-east, are several hydropathic establishments. Pop. 1698.

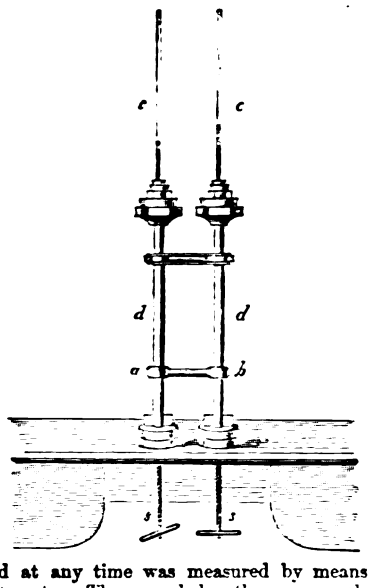
MATSYS, QUINTIN, a painter who was originally a blacksmith, born at Louvain in 1466. Different accounts are given of the occasion of his quitting the forge for the pencil; but most of his biographers agree that it was in consequence of becoming enamoured of the daughter of a painter, whose hand was to be obtained only by a master of the same profession. He quitted his native city in 1491 and went to Antwerp, when he was made a master of the famous guild of painters of that city. He chiefly painted portraits and half-figures in common life, but sometimes undertook great works, of which a Descent from the Cross, in the cathedral of Antwerp, is a favourable specimen. His picture of the Two Misers, at Windsor, is also much admired. He died in 1529.

MATTER. The idea of force seems to have arisen from consciousness of our own muscular exertion; but co-existent with this idea is the idea of matter, on which force exerts itself. Matter may appear in the solid, liquid, or gaseous state; sometimes useful purposes may be served by considering bodies such as tar and pitch as in a state intermediate between the solid and liquid states. To distinguish between solids and liquids we observe that the form of a solid body is not easily changed; that is, the form of a solid body can only be changed by the application of definite forces; whereas the form of a liquid body depends on the form of its containing vessel, and the smallest force imaginable acting on a portion of a liquid is able to alter its position relatively to the rest, thus changing the form of the body. A solid body may be caused to change its form, when sufficient time is allowed, by a force which would otherwise be too small to produce any such effect. But when the force becomes very small it cannot produce change of form, however much time may be allowed. In this we have the real distinction between solids and liquids. Very small forces will change the form of a liquid if sufficient time is allowed. A *perfect fluid* would be matter in such a state that it would resist pressures tending to diminish its volume, but would not resist pressures tending to change its form (except the resistance which all bodies oppose to being set in motion). No liquid known to us is a perfect fluid; all liquids (and, as Professor Clerk Maxwell has shown, all gases) possess viscosity, which is a sort of molecular friction incapable of preventing change of form, but which offers resistance while the change is being produced, this resistance being less as the change is made more gradually. This viscosity is to be distinguished from inertia, or the resistance which all bodies oppose to being set in motion. A gas tends to fill the vessel in which it is placed. If we imagine it formed of a great number of little particles, these particles must be continually striving to get as far away from each other as possible. When solid bodies are heated sufficiently they become liquids, and when liquids are heated sufficiently they become gases. It becomes more and more evident to physicists that the ultimate particles of matter are in rapid motion, and that when bodies are heated their particles move more rapidly. In a solid each particle seems to be constrained to a certain orbit; as the motion increases this orbit in general gets greater, and when so much heat has been given to the solid that it melts or becomes a liquid the particles move without restraint among each other. When the motion gets still greater by the addition of heat, and the body becomes a gas, the particles are far apart, and move about with great rapidity in straight lines, coming into collision with each other and the sides of the containing vessel continually. See GAS, MOLECULE.

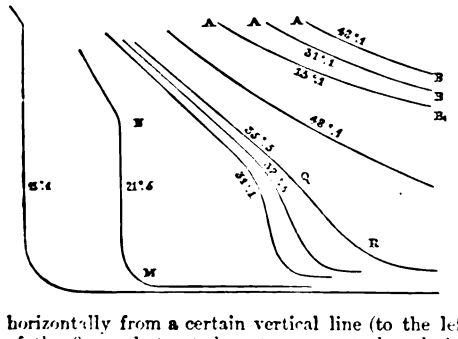
Many facts in physics are explainable by the supposition that there is a subtle medium filling interstellar and intermolecular space, which transmits heat and light and other disturbances (see INTERSTELLAR ÆTHER); this hypothetical medium must be almost infinitely elastic and imponderable, and must resemble a solid rather than a fluid.

MATTER, CONTINUITY OF STATES OF. The kinetic theory of gases, invented by Bernouilli to account for the tension of elastic fluids, revived in the second quarter of this century by Herapath, Joule, and others, and subsequently developed by Clausius and Clerk Maxwell, involved as a necessary consequence the absolute continuity of the gaseous and liquid states of matter; and the successive liquefaction of gases by Faraday and others proved it by induction. One of the results of Faraday's experiments led him to the conclusion that there is no broad distinction between gases and vapours, the difference in their nature being simply one of degree, a vapour being in reality a gas near its temperature of liquefaction. (See LIQUEFACTION OF GASES.) In the Bakerian Lecture of the Royal Society for 1869 (of which this article is mainly an abridgment) Dr. Andrews describes the fine series of careful experiments from which he deduced that 'the ordinary gaseous and liquid states of matter are widely separated forms of the same condition of matter, and may be made to pass into one another by a series of gradations so gentle that the passage shall nowhere present any interruption or breach of continuity.' The apparatus employed by Dr. Andrews consisted of two very strong copper or wrought-iron tubes *d*, communicating at *a b*. Dry air was inclosed in one of the strong glass tubes *c*. The gas to be-

experimented upon was inclosed in the other tube *c*. Short threads of mercury in the tubes *c* indicated the volumes of the gases; the height of each mercury



thread at any time was measured by means of a cathetometer. The space below the mercury threads, and everywhere inside the tubes *d*, was filled with water. Two fine screws *s*, when turned, forced themselves into the water space, so that the water and the gases might be subjected to pressure; it is evident (see HYDROSTATICS) that this pressure was nearly the same everywhere. A rectangular case (not shown in the figure) with plate-glass sides might surround each glass tube to keep it at any temperature, by means of a stream of water. The precautions taken to have light connections, and to have pure dry gases in the tubes, and the corrections applied to the observations of pressure and volume, cause these experiments of Dr. Andrews to be regarded as models for the imitation of physicists. The results with carbonic acid are given in the diagram; each of the curves A B indicates the variation of volume and pressure of dry air at some constant temperature; the other lines relate to carbonic acid. The vertical heights of points in a curve, from a certain horizontal line not shown in the cut, represent the relative volumes; and their distances, measured



horizontally from a certain vertical line (to the left of the figure, but not shown), represent the relative pressures to which the fluid was subjected. When the carbonic acid was always kept at the temperature °, it condensed at the pressure of 47 atmospheres: that is, the space in the tube was occupied partly by liquid and partly by gas, the surface of demarkation being distinctly visible; as the space was made smaller and smaller the gas became completely converted into liquid. Steam at 100° C. exhibits phenomena of the same kind, condensing when subjected to the pressure of one atmosphere. It is found, however, that liquid carbonic acid is far more compressible than ordinary liquids, and that its expansion by heat is much greater than that of ordinary liquids; in fact in its elasticity and expansion by heat it approximates more to a gas than ordinary liquids. This becomes more apparent at the temperature of 21°·5 C., when the gas condenses at sixty atmospheres, and the liquid occupies nearly one-third of the volume of the gas from which it condenses. Thus, although they are still quite distinct, the very heavy gas and the very light liquid are approximating to each other in their properties. But Andrews found that at 30°·92 C., which he called the *critical* temperature, and at the pressure of from 73 to 75 atmospheres, very slight changes of temperature or pressure changed the carbonic acid into a gas or into a liquid; these changes were indicated by flickering movements in the tube. If the temperature is above the critical point, for instance 31°·1 C., no liquefaction is observed, however great the pressure may be; until 73 atmospheres the carbonic acid behaves somewhat like air, although it does not nearly so well follow the law of Boyle (see AIR); from 73 to 75 atmospheres the volume diminishes rapidly, but by no means suddenly; and above 75 atmospheres the volume diminishes more gradually than in the case of a perfect gas, but yet more rapidly than in most liquids. In the curves for 32°·5 C. and 35°·5 C. we may observe changes of compressibility at Q and R, but the curve for 48°·1 C. is concave upwards everywhere. At this temperature we have reason to believe that the carbonic acid is a gas at all pressures. Since 1869 two attempts have been made to deduce Andrews' results from the molecular theory of the constitution of matter by means of the principles of thermodynamics. Readers may refer to Professor Clerk Maxwell's notice of one of these attempts in Nature, 24th Oct. 1874. He considers that the author, J. D. Van der Waals, has made a false assumption in his employment of one of Clausius' laws.

To make carbonic acid pass without any interruption of continuity from the gaseous to the liquid condition Dr. Andrews took a quantity of the gas at 50° C., exposed it to pressure increasing to 150 atmospheres, and then cooled it gradually to the temperature of the atmosphere. During these two processes no change of condition was observed in the gas, nor was there any sudden change in compressibility. He began with a gas, and it was easy to show that he ended with a liquid, for on removing the pressure boiling commenced. The question answered by Dr. Andrews was, What is the condition of carbonic acid when it is compressed at temperatures above 30°·92 C. from the gaseous state to the volume of the liquid without giving evidence at any part of the process of liquefaction having occurred? His answer he found 'in the close and intimate relations subsisting between the gaseous and liquid forms of matter. The ordinary gaseous and liquid states are, in short, only widely separated forms of the same condition of matter, and may be made to pass into one another by a series of gradations so gentle that the passage shall nowhere present any interruption or breach of continuity. . . . Under certain conditions of temperature and pressure carbonic acid finds itself, it is true, in what may be described as a state of instability, and suddenly passes, with the evolution of heat and without the application of

additional pressure or change of temperature, to the volume which by the continuous process can only be reached through a long and circuitous route. . . . There is no difficulty here, therefore, in distinguishing between the liquid and the gas. But in other cases the distinction cannot be made, and under many of the conditions I have described it would be vain to attempt to assign carbonic acid to the liquid rather than the gaseous state. Carbonic acid at the temperature of 35°·5, and under a pressure of 108 atmospheres, is reduced to $\frac{1}{213}$th of the volume it occupied under a pressure of one atmosphere; but if any one ask whether it is now in the gaseous or liquid state the question does not, I believe, admit of a positive reply' (Bakerian Lecture, Phil. Trans. 1870, p. 575). Dr. Andrews found that nitrous oxide, hydrochloric acid, ammonia, sulphuric ether, and bisulphide of carbon exhibited at fixed pressures and temperatures critical points and rapid changes of volume when the temperature or pressure was changed in the neighbourhood of those points. If physicists are to make a distinction between gases and vapours he would define a vapour to be a gas at any temperature under its critical point. Thus a gas cannot be liquefied by pressure.

The possible continuity of the solid and liquid conditions of matter is a difficult problem, the probable direction of the inquiry into which is indicated at the end of Dr. Andrews' paper. Professor James Thomson proved that the melting temperature of a solid changes with the pressure to which it is subjected. (See MELTING-POINT.) We might draw a number of curves, each expressing the relations between pressure and volume exhibited by ice and water at a certain temperature (if not much higher than 0° C.), if we knew exactly the rate of change of volume of ice with change of temperature and pressure. The writer is not aware of any series of such experiments having been made, but judging from the results of detached experiments it does not seem improbable that isothermal curves for ice and water should indicate the existence of a low critical temperature (just as the gradual approach of such points as M and N in Andrews' curves indicates a critical point), and therefore that by subjecting water to very great pressure at a temperature above 0° C., cooling to a low temperature, and decreasing the pressure, the water may be found to have been converted into ice without any apparent breach of continuity. For solids which expand on melting (see MELTING-POINT) the critical temperatures which we suppose to exist must be higher than the ordinary melting temperatures. In this case we may yet be able to obtain a gradual continuous transformation from the liquid to the solid state, by subjecting the liquid to very great pressure and cooling gradually to a temperature lower than the ordinary melting-point.

MATTHEW, an evangelist and apostle, son of Alpheus, previous to his call was a publican or officer of the Roman customs, and, according to tradition, a native of Nazareth. It is assumed by many divines that the publican Levi referred to by Mark and Luke is the same person as Matthew; yet this is disputed by Origen, Grotius, Michaelis, and Ewald. The accounts of his life are imperfect and uncertain. After the ascension of Christ we find him at Jerusalem with the other apostles, continuing with one accord in prayer and supplication, with Mary, the mother of Jesus, and with his brethren. This is the last notice we find of him in Scripture. Tradition represents him as having preached fifteen years in Jerusalem, and then to have visited other nations, among which are mentioned the Ethiopians, Macedonians, Persians, Syrians, &c., and as having suffered martyrdom in Persia. His Gospel has been supposed by some critics to have been originally written in Hebrew, or rather Aramaic, that mixture of Chaldee, Syriac, and Hebrew which was spoken in Palestine at that time, for the use of converted Jews, about A.D. 60. If this is the case, we have now only a Greek translation of it, the original having been lost. The chief aim of this Gospel is evidently to prove the Messianic character of Jesus. His narration is not according to the chronological order of events, and in his report of the teachings of our Saviour he appears to give them not precisely as they were delivered, but to arrange and group them according to the subject to which they more especially bear reference.

MATTHEW OF WESTMINSTER, an ancient English chronicler, was a Benedictine monk of the Abbey of Westminster, who lived in the fourteenth century. He compiled a chronicle commencing from the creation and extending to the year 1307, which he entitled Flores Historiarum (Flowers of Histories), whence he had the name of *Florilegus*. This work chiefly relates to English history, and is very freely transcribed from Matthew Paris. It was published in London, 1567, and at Frankfort, 1601; and there is also an edition of it in Bohn's Antiquarian Library.

MATTHIAS CORVINUS, King of Hungary, second son of John Hunniades. The enemies of his father kept him imprisoned in Bohemia, but in 1458, at the age of sixteen years, he was called to the throne of Hungary. Several Hungarian magnates opposed the election, and invited Frederick III. to accept the crown. The Turks, profiting by these dissensions, invaded and laid waste Hungary; but Corvinus, having compelled Frederick III. to resign to him the crown of St. Stephen, hastened to meet the Turks, and drove them from the country. Between 1468 and 1478 he conquered Silesia, Moravia, and Lusatia; he was also victorious over the Poles, and took the greater part of Austria, including Vienna, from Frederick, and held all his extensive conquests till his death. These wars obliged him to lay heavy taxes on his subjects, and he governed arbitrarily, but must be allowed to have been a man of extraordinary powers. During the whole of his disturbed reign he not only encouraged science, but cultivated it himself. It is much to be regretted that the great library which he collected at Buda was destroyed by the Turks twenty years after his death. At Buda he reposed from the toils of war, and collected scholars around him. In 1488, at a diet at Buda, he established laws against duels, for the better administration of justice, &c. He died in 1490, at Vienna, when occupied with preparations for a new war against the Turks. He left only a natural son, John Corvinus, who was not able to obtain the crown. The candidates for it were numerous. The Hungarians elected King Ladislaus VII. of Bohemia.

MATTO-GROSSO (Great Forest), the most western province of Brazil; bounded north by a range of mountains which separates it from Pará; east by the Araguaia, which separates it from Goyaz; south-east by the Parana, separating it from São Paulo; south by Paraguay; and west by Bolivia; area, 532,445 square miles. It is traversed, north-west to south-east, by a mountain chain, forming the principal watershed between the basins of the Amazon and the Rio-de-la-Plata. From the mountains innumerable streams descend, and proceed through lofty rocky valleys, which gradually spread out into immense plains. The principal rivers are the Guapore, Juruena, Xingu, Araguaia, Parana with its tributary Pardo, and the Paraguay with its tributaries São Lourenço and Tacoary. The dense forests which cover a great part of the surface have given the province its name.

They abound with inexhaustible supplies of the finest timber, both for common and ornamental purposes; but, from the deficiency of the means of transport, cannot at present be turned to much account. They also yield many rare and valuable gums, balsams, and medicinal plants. Cacao, jalap, and *maté* are of spontaneous growth. The wild animals which haunt the woods are extremely numerous. The province is rich in minerals. There is scarcely a district in which gold is not found, though the working of the mines has almost ceased to be profitable. Iron is abundant, but lies disregarded. Rock-salt and saltpetre are both worked to a limited extent. Over an extensive region near the centre diamond mines have been wrought from a very remote period, and still continue to yield a large revenue to government. In other quarters various other gems and crystals are obtained. In many of the valleys and plains the soil is of remarkable fertility, producing rich crops of rice, millet, mandioc, haricots, cotton, sugar, and tobacco; but as the number of inhabitants bears no proportion to the extent of the surface, the greater part of it necessarily remains in a state of nature. For administrative purposes Matto-Grosso is divided into two comarcas, Cuiaba and Matto-Grosso, subdivided into numerous districts. It sends only one deputy to the general legislative assembly, and appoints only one senator. The provincial assembly, consisting of twenty members, holds its sittings in Cuiaba. Pop. (exclusive of Indians) in 1872, 60,417.

MAUBEUGE, a town, France, department Du Nord, on the Sambre, 47 miles south-east of Lille. It is walled, and defended by several forts; is clean, well and regularly built, and has two churches, a communal college, and two hospitals; flax-mills, blast-furnaces, and manufactures of hardware, soap, and sugar; a salt-refinery, tanneries, and marble saw-works. It exports by the Sambre coal, marble, and slate, which form the principal articles of trade. In 1679 it was regularly fortified by Vauban, and in 1815, after the battle of Waterloo, it was besieged and taken by the allies, and held till 1818. Pop. 17,221.

MAULMAIN. See MOULMEIN.

MAUNDY-THURSDAY is the Thursday in the Passion week, called in England Maundy-Thursday, from the *maunds* or baskets in which the food was put which it was a common practice to distribute to the poor on that day. Another popular old name of the day is *Shere* Thursday, from the custom of shearing the hair which the priesthood used to observe. It used to be the custom in England and other countries, and still is in Austria, for the sovereign to wash the feet of a certain number of poor persons, and to send them away with presents in the shape of food, clothing, and money. In Rome the pope performs this menial office, but bishops are substituted for poor men. This ceremony is in commemoration of the act of Christ, who washed his apostles' feet on the occasion of the last supper.

MAUPERTUIS, PIERRE LOUIS MOREAU DE, a celebrated French mathematician and philosopher, was born at St. Malo in 1698, and studied at the College of La Marche, in Paris, where he discovered a strong predilection for the mathematics. At the age of twenty he entered the army, in which he served four years. In 1723 he was received into the Academy of Sciences, and soon after visited England and Switzerland, where he became a pupil and admirer of Newton, and formed a lasting friendship with the celebrated Bernouilli and his family. On his return to Paris he applied himself to his favourite studies with greater ardour than ever, and in 1736 formed one of the scientific party appointed to measure a degree of the meridian at the polar circle. In 1740 he accepted an invitation from the King of Prussia to settle at Berlin. On his return to Paris in 1742 he was chosen director of the Academy of Sciences, and the following year received into the French Academy. He returned to Berlin in 1744, and in 1746 was declared president of the Academy of Sciences at Berlin, and soon after received the order of merit. His unhappy restlessness of temper was a source of continued disquiet to him, and a controversy with König, which subjected him to the satire of Voltaire, completed his uneasiness. At this time his health, injured by his northern expedition and incessant application, began to give way, and he sought relief by repeated visits to his native country. His disorder, however, seems to have uniformly revived with his return to Berlin; and he at length died on his return from one of these excursions at the house of his friend Bernouilli, at Basel, in 1759, in the sixty-first year of his age. His works, collected in four 8vo volumes, were published at Lyons in 1756, and reprinted in 1768. Among them are Discourse on the Different Figures of the Stars; Reflections on the Origin of Languages; Animal Physics; System of Nature; On the Progress of the Sciences; Elements of Geography; Expedition to the Polar Circle; On the Comet of 1742; Dissertation upon Languages; Academical Discourses; Upon the Laws of Motion; Upon the Laws of Rest; Operations for Determining the Figure of the Earth; &c.

MAURA, SANTA. See LEUCADIA.

MAUREPAS, JEAN FRÉDÉRIC PHELIPPEAUX, COUNT DE, born in 1701, was, at the early age of twenty-three years, minister of the French marine. At his suggestion Cardinal Fleury named Amelot minister of foreign affairs, and the latter undertook nothing important without the concurrence of Maurepas, who finally administered the foreign department himself. He was hasty in his decisions, without system or foresight, but quick in conception, amiable, flexible, artful, and penetrating. He made up in dexterity what was wanting in reflection, and was one of the most agreeable of ministers. An epigram on Madame de Pompadour, of which he was accused of being the author, led to his banishment from the court. Louis XV. recalled him in 1774, and placed him at the head of his ministry. Removed from public affairs for the space of thirty years, Maurepas had lost whatever requisite he had ever possessed for the administration of government. With the imprudence of his youth was now united the feebleness of age. He retained the confidence of the king till his death, Nov. 21, 1781; but he was destitute of the vigour necessary to avert the troubles which soon after shook the kingdom. France was, however, indebted to him for some improvements in the marine. The Memoirs of Maurepas, composed by Sallé, his secretary, and edited by Soulavie, are amusing, but carelessly written.

MAURICE, DUKE, and after 1548 Elector of Saxony (of the Albertine line), born in 1521, displayed, from his early years, great talents, united with a restless, active, and ardent spirit. In 1541 the death of his father, Henry the Pious, placed him at the head of the government at the moment when the religious disputes had divided the German princes. Although a favourer of Protestantism he refused to join the league of Schmalkalden for the defence of the new doctrines, either out of attachment to Ferdinand, king of Hungary and Bohemia, against whose brother, Charles V., the league was organized, or because he foresaw that it could not stand. In 1546 he concluded a secret treaty with the emperor, and was obliged to execute the ban of the empire against John Frederick, elector of Saxony (of the Ernestine line), and take possession of his territories. In 1547

the emperor conferred on him the electoral dignity of Saxony, and the greater part of the hereditary estates of the late elector. Charles now thought the moment was come to execute his project of annihilating the rights and privileges of the German princes, and rendering himself absolute master of Germany; and although he artfully maintained a show of protecting the Catholics, he laboured only for his own selfish interests. Maurice was not slow to penetrate the crafty policy of the ambitious monarch. Convinced that a forcible resistance would become necessary, he made his preparations, in 1550, under the pretence of executing the decree of the diet against Magdeburg, concluded a secret treaty with Henry II. of France and some of the German princes (1551), and behaved so warily that he had nearly succeeded in making Charles, who lay sick with the gout at Innsbruck, his prisoner (1552). In justification of this unexpected act of hostility Maurice alleged the detention of his father-in-law by the emperor, contrary to solemn promises. The emperor upon this set free the prince, whom he held captive, and proposed terms of accommodation by his brother Ferdinand. The result of this negotiation was the famous Treaty of Passau (which see), July 31, 1552. Maurice, who had thus recovered the favour of the Protestants, now thought proper to give the emperor likewise a proof of his attachment by serving against the Turks. Nothing, however, was effected, and he soon after returned to Saxony. July 9, 1553, he defeated Albert, margrave of Brandenburg-Kulmbach, who refused to accede to the Treaty of Passau, at Sievershausen, and died of a wound received in that battle two days after. Maurice possessed the talents of a great prince and general, with a prudence that enabled him to take advantage of circumstances, and although one of the least religious men of the time, the rights of Protestant and Catholic were strictly maintained. Notwithstanding the shortness of his reign Saxony is indebted to him for many useful institutions.

MAURICE, JOHN FREDERICK DENISON, a distinguished Anglican divine, the son of a Unitarian minister, was born, in 1805, at Normanston, in Suffolk. In 1823 he entered Trinity College, Cambridge, where he contracted a friendship with John Sterling, only interrupted by the death of the latter, and which was more firmly cemented by their marriage to two sisters. At the university his reputation for scholarship stood so high, and he passed his examinations with so much distinction, that he was offered a fellowship, which he declined on the ground that he could not sign the Thirty-nine Articles. In 1828 he settled in London, and applied himself to literature, his first work of any extent being Eustace Conyers, a novel, published in 1834. He also contributed, along with Sterling, to the Athenæum, then recently started by J. S. Buckingham. After the lapse of two years he experienced such a change in his religious sentiments as induced him to become not merely a member but a clergyman of the Church of England. Lest his motives in taking this step might be misinterpreted he took his degree at Oxford instead of Cambridge, and was ordained priest in 1835. In 1836 he was appointed chaplain to Guy's Hospital, a post which he kept for ten years, and which gave him a familiar acquaintance with the life of the London poor. In 1840 he became professor of modern history and English literature in King's College, London, and in 1846 professor of ecclesiastical history. In 1853 he published a volume of theological essays, one of which, containing an expression of opinion contrary to that of the unlimited duration of future punishment, was denounced as heretical by the principal of King's College, and in consequence its author was compelled to resign his chairs. In 1854 he founded the first working-man's college in London, of which he became principal. The same year he gave a series of lectures at Willis's Rooms on co-operative societies as a means of benefiting the working-classes. In 1860 he was appointed perpetual curate of St. Peter's, Vere Street, Cavendish Square, and in 1866 professor of moral philosophy at Cambridge, a position which he held until his death, which occurred 1st April, 1872. Although always looked up to as one of the leaders of the 'Broad Church' party, Maurice repudiated any sectional tendency, and disclaimed the ambition of being the founder of a religious school. Besides his active interest in all matters tending to improve the condition of the labouring classes, he devoted considerable attention to the subject of female education. Besides the books above mentioned, he published several volumes of sermons and treatises on the History of Moral and Metaphysical Philosophy, the Religions of the World, the Prophets and Kings of the Old Testament, Patriarchs and Lawgivers of the Old Testament, the Kingdom of Christ, the Doctrine of Sacrifice, Lectures on the Ecclesiastical History of the First and Second Centuries, &c. He also contributed to the Spectator and Macmillan's Magazine.

MAURICE OF NASSAU, Prince of Orange, the youngest son, by a second marriage, of William I., prince of Orange, born at Dillenburg, 14th November, 1567, was studying at Leyden, in 1584, when his father was assassinated. The provinces of Holland and Zeeland, and soon after Utrecht, immediately elected the young prince stadtholder, and his talents as a general surpassed all expectations. In 1590 he took Breda by surprise, and in 1591 Zutphen, Deventer, Nimeguen, and other places, surrendered to him. In 1593 he invested Gertruydenberg, and on May 22d, 1594, he invested Gröningen, which fell into his hands on the 24th of July. In January, 1587, assisted by some English auxiliaries, he defeated the Spaniards at Turnhout, and on 2d July, 1600, he inflicted a signal defeat on the Archduke Albert at Nieuport. With the chief command, by land and sea, of all the forces of the United Provinces, he also received the stadtholdership of Guelderland and Overyssel, that of Friesland and Gröningen being conferred on his cousin William, count of Nassau. Previous to the truce of twelve years, concluded in 1609, when Spain was compelled to acknowledge the United Provinces as a free republic, about forty towns and several fortresses had fallen into his hands. He had defeated the Spaniards in three pitched battles, besides the naval victories which were gained by the vice-admirals of the republic on the coasts of Spain and Flanders. Thus become the object of general affection and respect to his countrymen, his ambitious spirit now aimed at the sovereignty. To effect his purposes he took advantage of the religious quarrels of the Arminians and Gomarists, or the Remonstrants and Counter-Remonstrants. (See ARMINIANS.) He supported the Gomarists, even to acts of violence (see BARNEVELDT), but notwithstanding all his efforts he was compelled to abandon his project. He died at the Hague, April 23, 1625, and was succeeded by his brother Frederick Henry.

MAURICIUS, FLAVIUS TIBERIUS, one of the greatest emperors of the East, descended from an ancient Roman family settled in Asia Minor, was born at Arabissus, in Cappadocia, about 539 A.D. Though he served in the army his name does not become conspicuous in history until 578, when Justin II. intrusted him with the command against the Persians in Mesopotamia. He commenced by restoring the relaxed discipline of the troops, and after varied fortune, having nearly annihilated (581) the Persian army, on the invitation of the emperor he entered Constantinople in triumph (582). On the death of

Tiberius, in August of the same year, Mauricius ascended the throne at the mature age of forty-three. Just then the Persians broke the peace and attacked the empire. They maintained the contest with almost unvarying success till Philippicus nearly destroyed their army in 586. Incompetency or treason on the part of the imperial generals again gave the advantage to the Persians, and it was not till a commotion arose in Persia that affairs took a turn in favour of the Byzantines. Chosroes, the Persian king, being defeated by Baram, a rebel general, repaired to Hierapolis, whence he sent a letter to Mauricius, imploring his aid for the recovery of his throne. A powerful army, augmented by great numbers of local Persians, assembled on the frontiers, defeated the rebel Baram, and (591) restored Chosroes to the throne of his ancestors. As a reward for his timely and valuable assistance Dara and Martyropolis, the bulwarks of Mesopotamia, were given to Mauricius. Soon after, the war with the Avars was renewed, and after several campaigns, attended with less success than was expected, the Byzantines under Comentiolus, a faithless and cowardly intriguer, sustained a signal defeat, and 12,000 veteran Romans remained prisoners of war with the Avars. For the ransom of these 6000 pieces of gold were demanded, which Mauricius, actuated by powerful but secret motives, refused to pay, and the veterans were put to death by their captors. This action of the emperor was imprudent and proved his ruin, for when, in 602, he ordered his troops under Priscus to winter on the northern side of the Danube, where they would have been exposed to the attacks of the Avars, they complained that he meant to sacrifice them as he had done their 12,000 brethren, and broke out into open revolt. Electing Phocas for the chief command they marched on Constantinople, whence Mauricius fled to the provinces. Phocas arriving in Constantinople was proclaimed emperor, 23d November, 602. He immediately despatched executioners in search of his predecessor, who, with his family, had taken sanctuary in the church of St. Autonomus, near Chalcedon. They were dragged to the scaffold and executed, 27th November, 602.

MAURITANIA, or MAURETANIA, the ancient name of the north-western portion of Africa, corresponding in its area to what is now known as the Empire of Morocco and the western part of Algeria. It derived its name from its inhabitants, distinguished by the ancients as *Mauri*, a word in the Alexandrian dialect equivalent to 'Blacks.' The ancient boundary of Mauritania on the south was the Atlas. In A.D. 40 it became a Roman province. From 429 to 534 A.D. it was held by the Vandals, and in 650 A.D. it was conquered by the Arabs.

MAURITIUS, or ISLE OF FRANCE, an island in the Indian Ocean, a colony of Great Britain, lying east from the island of Madagascar; lat. (Port Louis the capital), 20° 9′ 42″ S.; lon. 57° 31′ 45″ E. It is of an oval form, about 40 miles north-east to south-west, and 25 miles in breadth, and is surrounded by coral reefs. It is composed chiefly of rugged and irregular mountains, rising usually into points of considerable height; the highest are the Montagne de la Rivière Noire, 2700 feet, and the singular isolated rock Peter Botte, 2600 feet. Between the mountains, however, and along the coast, there are large and fertile plains and valleys, having a rich soil of black vegetable mould or stiff clay, and watered by numerous streamlets, many of which become periodically dry. The climate is pleasant during the cool season, but oppressively hot in summer, and the island is occasionally visited by severe epidemics, one of which in 1867 carried off 30,000 of the population. When discovered the island was almost entirely covered with wood, a considerable part of which has now been cut down, although some extensive forests still remain. Some of the trees are very valuable, particularly the black ebony, esteemed the most solid, close, and shining of any in the world. In the general character of its vegetation Mauritius is somewhat similar to that of the Cape in the number of succulent plants, cactuses, spurges, aloes, house-leeks, fig-marigolds, &c. Many plants introduced from Europe, Africa, Madagascar, and India thrive well. Shady groves of mango, dense masses of mimosa, and nearly every beautiful tropical tree are met with here. The principal objects of cultivation are sugar, rice, maize, manioc, and vegetables, and to a limited extent coffee, pepper, and the mulberry for the production of silk. The exports of sugar, which is the staple, amounted in 1875 to 87,449 tons; in 1881 to 112,418 tons; value respectively £1,959,165 and £3,184,629. The value of the exports in 1875 was £2,522,099; in 1881, £3,477,[illegible]; of the imports in 1875, £2,194,824; in 1881, £2,029,971. The imports consist of rice, wheat, cattle, cotton goods, haberdashery, hardware, &c. The government is vested in a lieutenant-governor and legislative council, subordinate to the orders of the sovereign in council. The revenue for 1881 was £781,331, and the expenditure was £760,017. The chief sources of revenue are the customs and licenses on trades and professions; the expenditure is chiefly on the civil service and on the railways, two separate lines of which, having a total length of 87 miles, now cross the island. Mauritius was discovered in 1505 by the Portuguese. The Dutch took possession of it in 1598, and named it Mauritius, in honour of Prince Maurice. It eventually fell into the hands of the French, from whom it was captured by the British in 1810, and definitively ceded to them in 1815. In December, 1854, it was made the seat of a bishopric. Principal towns are Port Louis and Mahebourg. Estimate pop. 31st December, 1881, 359,419, a great portion of whom were originally coolies imported to work the sugar estates.

MAURY, MATTHEW FONTAINE, LL.D., a distinguished American naval officer and hydrographer, was born in Virginia, January 14, 1807, and entered the United States navy in 1824. During a voyage round the world in the *Vincennes* frigate he commenced a treatise on navigation which was long used as a text-book in the navy. He was made lieutenant in 1836. He was always a studious man, and possessed great powers of application; but it was not till 1839, when he was lamed by an accident, that he quitted active service afloat for scientific work at the Washington Observatory. His powers of application were combined with rare gifts of imagination, and a style elevated almost to the poetic; so that when his observations had furnished him with the materials for his Physical Geography of the Sea, it was pronounced to be one of the most fascinating books in the language, though now many of its theories are admitted to be quite erroneous. In 1844 he introduced his works on the Gulf Stream, Ocean Currents, and Great Circle Sailing. His wind and current charts have been practically beneficial to an extent that cannot easily be estimated. He projected the maritime conference at Brussels in 1853; and in 1855, having now the rank of commander, he published Letters on the Amazon and Atlantic Slopes of South America. In 1861, when the Southern States seceded from the Union, Maury adopted the side of his state, and resigned his appointment at the Washington Observatory. Russia and France both attempted to secure his services, but he remained true to his state till hope was gone. He for some time attached himself to the fortunes of

the Archduke Maximilian in Mexico; but for the last few years of his life he occupied the position of a professor at the College of Lexington in Virginia. Here he died 1st February, 1873. He was among the first to turn attention to a branch of scientific investigation which had been previously much neglected, the investigation, namely, of the depths of the sea, its currents, temperature, &c., a subject which is now considered of the utmost importance. At his death Maury held the rank of captain.

MAUSOLEUM (Greek, *mausoleion*), from Mausolus, a king of Caria, to whom a sumptuous sepulchre was raised by his wife Artemisia, at Halicarnassus. King Mausolus is said to have expired in the year 353 B.C.; and his wife was so disconsolate at the event that she drank up his ashes, and perpetuated his memory by the erection of this magnificent monument which became so famous as to be esteemed the seventh wonder of the world, and to give a generic name to all superb sepulchres. From Pliny we learn that its entire height was 140 feet, and the entire circuit 411 feet. The sculptors employed to adorn it were Scopas, Bryaxis, Timotheus, and Leochares. It was overthrown, probably by an earthquake, between the twelfth and fifteenth centuries; and when the knights of Rhodes took possession of Halicarnassus in 1404 they availed themselves of the materials of the mausoleum to erect the fortress of San Pietro. While excavating they discovered a large chamber enriched with marble pilasters, and richly inlaid panels. In another hall they discovered the sarcophagus of the founder. Many of the sculptures have recently been brought to light by the excavations of Mr. Newton of the British Museum. These consist of statues, bassi-rilievi, columns, &c., broken and fragmentary, which were collected and sent to England. Among other restorations the experts of the British Museum succeeded in piecing together, from more than sixty fragments, a draped statue, 10 feet high, of Mausolus himself. The rilievi form an entire length of upwards of 80 feet of frieze. Not only has the actual site been discovered, but the extent, dimensions, and character of the edifice have been elucidated with sufficient clearness to enable a competent architect to present us with a ground-plan and elevation of the entire mausoleum. Other famous mausoleums are, that erected at Babylon by Alexander the Great in honour of Hephæstion, equally magnificent with that of Mausolus, though less refined. A description of it is given by Diodorus (xvii. 115). The mausoleum of Augustus, built by him in the sixth consulate on the Campus Martius, between the Via Flaminia and the Tiber, the ruins of which are still seen near the church of St. Roque. One of the obelisks which stood before this superb building was found in the reign of Pope Sixtus V., and placed before the church of St. Maria Maggiore. This mausoleum contained the ashes of Augustus, Marcellus, Agrippa, Germanicus, and of some later emperors. The *Mausoleum Hadriani* is now the castle of St. Angelo.

MAUVEINE, another name for magenta (which see).

MAVROCORDATO, Alexander, Prince, a Greek politician and diplomatist, was born at Constantinople, 11th February, 1791. After receiving an excellent education, and having become an accomplished linguist, in 1817 he undertook the duties of secretary to his uncle John Caradja, hospodar of Walachia. In 1821 he took an active part in the Greek contest for independence. As president of the General Assembly of Epidaurus he prepared the declaration of independence, and promulgated the provisional constitution in December of the same year. On the 1st of January, 1822, he was elected president of the executive council; and being invested with the chief command, he led an expedition to Epirus, which resulted in the unsuccessful battle of Peta. In the summer of this year he met Lord Byron at Missolonghi, from whom he received material aid for the prosecution of the contest. His bold and resolute defence of Missolonghi, from November 1822 to January 1823, saved the Peloponnesus. Unwilling to enter into a struggle with Colocotronis, whom he accused of ambitious views, and feeling himself powerless to re-establish union between the divided chiefs, he divested himself of the title of president, accepting, however, the post of secretary of the executive. Becoming greatly involved in political strife he withdrew from the Morea; but he exerted himself indefatigably to obtain for the Greeks the protection of England. Though opposing strenuously the pro-Russian policy of Capo d'Istrias, he did not hesitate, under his government, to accept a mission to Crete, and busy himself actively with the arming of the Grecian fleet. After the protecting powers placed Otho on the throne of Greece Mavrocordato, though dissatisfied with this procedure, undertook the duties of minister of the finances; but he soon confined himself to diplomacy, and was ambassador successively at Munich, Berlin, and London. In 1840 he made an unsuccessful attempt to form a ministry. During the insurrection of 1843–44 he was president of the Constitutional Assembly; and after Otho swore to the constitution, on the 30th March, he became president of the council, an office from which he soon retired. In 1850 he went as ambassador to Paris, and on the outbreak of the Crimean war he was once more placed at the head of the government. This dignity he resigned in 1856, and withdrew altogether into private life, though continuing to take a deep interest in promoting education. He died at Ægina, August 18, 1865.

MAXEN, a village in the circle of Meissen, kingdom of Saxony, 9 miles S.S.E. of Dresden, famous for the surrender of the Prussian General Finck, with 12,000 men, to the Austrian General Daun, Nov. 21, 1759, in the Seven Years' war. It has mineral baths. Pop. 717.

MAXENTIUS, M. Aurelius Valerius, a Roman emperor, son of Maximianus, was, A.D. 306, proclaimed Augustus by the prætorians, and acknowledged by the people and senate of Rome, to whom Galerius had become hateful. Severus was sent by Galerius against him and his father, who had joined him; but Maximianus compelled Severus, who had marched upon Rome, to retreat to Ravenna, and having got him into his power, put him to death in 307. Galerius now marched in person against Rome, but was likewise compelled to retreat. Maxentius afterwards availed himself of an insurrection of the Africans under a certain Alexander, in 311, to declare war against Constantine the Great, giving out that his object was to avenge his father's death. While Constantine pressed forward into Italy and defeated the captains of Maxentius at Turin and Verona, Maxentius himself remained inactive at Rome, and did not go out to meet Constantine till he had passed unopposed across the Apennines. At the great battle which was fought shortly after, October 27, 312, at Saxa Rubra near Rome, Maxentius was defeated, and perished in the Tiber as he tried to escape over the Mulvian Bridge.

MAXILLA (Latin, *maxilla*, a jaw), the term applied in comparative anatomy to the upper jaw-bones of Vertebrates, in contradistinction to the mandible or lower jaw; and in Invertebrata to the second or lesser pair or pairs of jaws. Thus in insects, spiders, crustaceans, &c., the maxillæ form definite and important organs in the trituration and division of food.

In insects one pair of maxillæ exists, these organs being furnished with one or more pairs of *palpi* or organs of touch, known as *maxillary palpi*. The lower lip or *labium* (which see) in insects is typically composed of a second united pair of maxillæ, which also bear palpi—the *labial palpi*. In the higher Crustacea two pairs of maxillæ exist; and in the higher Arachnida (for example, spiders and scorpions) a single pair only is present, each maxilla being provided with a long palp, which in the female spiders bear pointed claws, and in the males subserve some part of the reproductive process. In the Scorpions the maxillary palps terminate in pincer-like claws or *chelæ*. In the Myriapoda (centipedes and millepedes) maxillæ are also present, but undergo modification throughout the class.

MAXIMIANUS I., M. Aurelius Valerius, Roman emperor (286–305), born of humble parents in Pannonia, had so approved himself by his services in the army that Diocletian selected him for his colleague, creating him first Cæsar (285), then Augustus (286), and at the same time conferred on him the honorary appellation of Herculius. Maximianus had the care of the Western Empire, while Diocletian undertook that of the Eastern. In 287 he was consul along with Diocletian, and in the same year conducted a campaign in Gaul. In the following year he was a colleague in the consulship with Pomponius Januarius. After conducting several wars, in 303–304 he was for the seventh time made consul, having for his colleague Diocletian for the fifth time, with whom he abdicated, 1st May, 305. In the following year he was again invested with the imperial title by his son Maxentius, to whom his services against Severus and Galerius were of the most important kind. His son shortly after expelled him from Rome, when, repairing to Gaul, he found a refuge with Constantine, who had married his daughter Fausta. In 308 he caused himself to be proclaimed Augustus at Marseilles, but Constantine easily deposed him. Having attempted to induce Fausta to destroy her husband, Constantine compelled him to strangle himself, Feb. 310.

MAXIMILIAN I., Emperor of Germany, son and successor of Frederick III., born 22d March 1459, married, 20th August, 1477, Mary of Burgundy, heiress of Duke Charles the Bold, the son of which marriage (the Archduke Philip), was the father of Charles V. and Ferdinand I. Maximilian was elected King of the Romans in 1486, and ascended the imperial throne in 1493, under very unfavourable circumstances. Germany, under the reign of his predecessor, had become distracted and feeble. Maximilian's marriage had, indeed, brought the territories of Charles to the house of Austria; but he had been stripped of them by the policy of Louis XI., to whose son, the dauphin, afterwards Charles VIII., Margaret, the daughter of Maximilian, had been betrothed, giving as her dowry Artois, Flanders, and the Duchy of Burgundy. But Charles having obtained the great province of Bretagne by marrying the heiress Anne, to whom Maximilian had been married by proxy, sent back Margaret to her father. Maximilian, incensed at this double affront, took up arms, but a peace was concluded at Senlis in 1493, and Artois, Flanders, and Burgundy, were restored to Germany. In 1494 Maximilian was married a second time to Bianca Sforza of Milan. Maximilian was enterprising, politic, brave, and of a noble and generous temper; yet his best plans often failed through his excessive ardour and his want of perseverance, and the miserable administration of his finances often deprived him of the fruits of his most fortunate enterprises. He could not prevent the separation of Switzerland from the German Empire in 1498 and 1499; and his plans for limiting the power of Louis XII. in Italy, and compelling him to renounce his claims on Milan, involved him in perpetual wars, without securing to him the possession of Milan. Not less unsuccessful was the League of Cambray against Venice, which he concluded (1508) with the pope, Spain, France, Mantua, and Modena. (See League.) Maximilian afterwards took the field against France; and for the purpose of raising money, ceded Verona to the Venetian Republic for 200,000 ducats. His measures in the domestic affairs of the German Empire, which for 300 years had been the theatre of barbarism and anarchy, were more creditable. What his predecessors had so long vainly attempted Maximilian successfully accomplished. In 1495 he had put an end to internal troubles and violence by the perpetual peace of the empire, decreed by the Diet of Worms. (See Germany—History.) To supply the defects of the German laws and prevent the gross abuses of justice, he adopted, at the same diet, the Roman and canon laws, as subsidiary authorities, in the decision of differences, and instituted the imperial chamber (see Chamber, Imperial) as the supreme tribunal of the empire. He put a stop to the monstrous abuses of the Westphalian *Femgerichte*, although he was unable entirely to abolish those secret tribunals. (See Femgerichte.) The institution of the German circles, which were intended to secure internal peace and safety, originated from him, as did many other useful institutions for the improvement of the government, and the promotion of science and art. He reformed the public law of Germany, created German military discipline, and was the first to establish a standing army with infantry, cavalry, and artillery. By peaceful means he increased his hereditary dominions; for the marriage of his son Philip with the Infanta Juana, and of his daughter Margaret with the Infant Juan of Spain, brought about the union of Spain with Austria; while he secured the reversion of Hungary and Bohemia to his posterity by the double marriage of his grand-daughter and grandson with the son and daughter of King Ladislaus. Maximilian was himself a poet, and was the author of a circumstantial but romantic account of his own life, though the work was really written by his private secretary Marx Treizsaurwein von Erentreiz. It was first published in 1775, in folio, under the title Der weiss Kunig, with wood-cuts by Hans Burgkmair. Maximilian died at Wels, in Upper Austria, 12th January, 1519, and was succeeded by Charles V.

MAXIMILIAN, Emperor of Mexico, known in his earlier life as Ferdinand Maximilian Joseph, Archduke of Austria, born at Vienna, 6th July, 1832, was the second son of the Archduke Francis Charles, and younger brother of Francis Joseph I., emperor of Austria. After receiving a careful education he entered the Austrian navy in 1846, and after holding various subordinate commands he obtained the rank of rear-admiral, and was placed at the head of the Austrian marine. Quitting the naval service he was appointed governor of the Lombardo-Venetian Kingdom, February, 1857, and on the 27th of the following July he married the Princess Charlotte of Belgium, daughter of King Leopold I. He discharged the duties of his governorship with so much care and judgment that he was deservedly popular. On his return from a voyage made to Brazil for scientific purposes he fixed his residence at Miramar, in the vicinity of Trieste, and there, October 3d, 1863, he received a deputation from the Mexican Assembly of Notables, who offered him the crown of their country, in virtue of a decree of 10th July preceding. These notables, however, were merely puppets in the hands of the French, who had inter-

fered in the affairs of Mexico. Considerations of duty and the romantic ardour of his disposition induced him to accept the offer, on the conditions that his brother should sanction his choice, and that he should have evidence that the people were in his favour. His scruples having been overcome, and having conditionally renounced his rights as an Austrian prince, he formally accepted the Mexican crown, 10th April, 1864. Embarking in an Austrian frigate a few days later he landed at Vera Cruz on the 29th of May, and entered Mexico on the 12th of June. Both Maximilian and the empress were extremely popular. He set himself energetically to consolidate and develop his dominions, granted an amnesty to political offenders, and exhibited a parental solicitude in the matters of faith, worship, and education. But he failed to conciliate the Republican party, or to induce them to acquiesce in the form and personality of a government forced on the country by France; and as he could not restore to the clergy their confiscated estates they pronounced him a traitor. Meanwhile there were incessant conflicts between the partisans of President Juarez and the allied French and Imperial troops; and the decree of October 3d, 1865, in virtue of which the members of the Juarist bands and those who abetted them were shot, alienated the party of the Liberals. Juarez raised the standard of independence, and came into collision with the French troops; jealousies and misunderstandings arose with Bazaine; the impatience of the French people under the cost of the expedition, and the representations of the cabinet of Washington, which reprobated the idea of European interference in attempting to establish a monarchy on the continent of North America, and urged the Emperor Napoleon to withdraw his troops;—all these complications and misfortunes thickening around Maximilian rendered his position critical in the extreme. The empress in vain undertook a mission to Europe to enlist support for her husband, and grief and disappointment overthrew her reason. The French were forced to retire; but Maximilian, in compliance with the prayer of a Convention of Notables, decided to remain, in the hope of being able to maintain the empire. While bravely defending Queretaro against a Liberal force under Escobedo, he was betrayed by General Lopez on the night of May 14th, 1867. By order of the Liberal minister of war he was, along with two of his generals, tried by court-martial, and condemned to be shot. The representations and protests of the various European powers against this breach of the laws of civilized warfare failed to arrest the execution of the sentence, which was carried into effect at seven in the morning of July 19th. His body was after some delay surrendered to his relatives, and his funeral was celebrated with great pomp in the cathedral of Vienna, on the 18th of January, 1868. Maximilian was a man of eminent abilities, and high and varied culture. His collected writings are contained in a posthumous publication entitled Aus Meinem Leben: Reiseskizzen; Aphorismen; Gedichte (four vols. 8vo, Leipzig, 1867), which gives ample testimony to the vigour of his intellect, the variety of his attainments, his good sense, candour, and generosity.

MAXIMINUS, Caius Julius Verus, the son of a peasant of Thrace, was originally a shepherd, and by heading his countrymen against the frequent attacks of the neighbouring barbarians and robbers, inured himself to the labours and to the fatigues of a camp. He entered the Roman army under Septimus Severus before 210, and gradually rose to the first offices. On the death of Alexander Severus, slain in a mutiny of his troops excited by Maximin, he caused himself to be proclaimed emperor, A.D. 235, and immediately made his son his colleague. The popularity which he had gained when general of the armies was at an end when he ascended the throne. He delighted in acts of barbarity, and no fewer than 400 persons lost their lives on the false suspicion of having conspired against the emperor's life. Some were exposed to wild beasts; others expired by blows; some were nailed on crosses; while others were shut up in the bellies of animals just killed. The patricians were peculiarly the objects of his cruelty, as if they were more conscious than others of his mean origin. In an expedition in Germany he cut down the corn, and laid waste about 450 miles with fire and sword. Such a monster of tyranny at last provoked the people of Rome. The Gordians were proclaimed emperors; but their pacific virtues were unable to resist the fury of Maximin. After their fall the Roman senate invested twenty of their number with the imperial dignity, and intrusted to their hands the care of the republic. These measures so highly irritated Maximin that at the first intelligence he howled like a wild beast, and almost destroyed himself by knocking his head against the walls of his palace. When his fury was a little abated he marched to Rome, resolved on slaughter, but his soldiers, ashamed of accompanying a tyrant whose cruelty had procured him the names of *Busiris*, *Cyclops*, *Phalaris*, *Sciron*, *Typhon*, or *Gyges*, assassinated him in his tent before the walls of Aquileia, A.D. 238. He was then in the sixty-fifth year of his age. The news of his death was received with the greatest rejoicings at Rome; public thanksgivings were offered, and whole hecatombs flamed on the altars. Maximin has been represented by historians as of a gigantic stature; he was 8 feet high, and the bracelets of his wife served as rings to adorn the fingers of his hand. His voracity was as remarkable as his corpulence: he ate 40 pounds of flesh a day, and drank eighteen bottles of wine. His strength was proportionable to his gigantic shape; he could draw a loaded waggon; with a blow of his fist he often broke the teeth in a horse's mouth, or broke its leg with a kick, and he could cleave young trees with his hand. But some deductions must be made from the statements of ancient writers.

MAXIMUM, the greatest value of a variable quantity. It is not, however, applied merely to the absolute greatest value, but to the value at any time when it ceases to increase and begins to decrease. The analytic method of finding the maximum and minimum values of variable mathematical quantities is of importance in the differential calculus.

MAXIMUM DENSITY OF WATER. As a general rule, to which water is a notable exception, bodies expand regularly as they get warmer. Now if water is substituted for mercury in a thermometer, it may be heated and cooled and its volume and temperature observed. It is found to contract as it is cooled until the temperature of 4° C. is reached; this is the point of its maximum density, for on continuing the cooling process it expands. Some of M. Despretz's results are given in the following table:—

Water at 4° C. has a density = 1.

Temp.	Density.	Temp.	Density.	Temp.	Density.
− 9° C.	0·998371	2° C.	0·999966	10° C.	0·999731
− 7	0·998565	3°	0·999999	20°	0·998213
− 5	0·999302	4°	1·000000	40°	0·992329
− 3	0·999577	5°	0·999999	60°	0·98..3·3
− 1	0·999786	6°	0·999969	80°	0·971959
0	0·999873	7°	0·999929	100°	0·958634
1	0·999927	8°	0·999878		

In every case the water was only subjected to the pressure of one atmosphere. In this table the density of

water at temperatures below 0° C. is given; it is well known that if water is free from air and is cooled very slowly in a still place, it may be cooled much lower than its ordinary freezing-point without solidifying. On a cold night the upper layer of water in a pond becomes cooled and sinks; this process goes on until all the water in the pond has a temperature of 4° C. The upper layers becoming cooler than 4° C. are now lighter than the others, so that they cool to 0° C., and freeze without sinking, for ice is lighter than the water from which it is formed. Thus the pond becomes covered with ice, the lower layers of water remaining at the temperature of 4° C. Only for this curious exceptional behaviour of water in cooling, ponds would freeze from below upwards, and would become one mass of ice, killing fish and all other living things within them.

MAXIMUM THERMOMETER, a thermometer which, when examined, shows what has been its highest temperature since it was last examined and set. In *Rutherford's* the mercury column of an ordinary thermometer pushes before it along the tube, which is horizontal, a small steel index, which is not drawn back by the mercury when it contracts. After examining the instrument it may be set by shaking the index back to the mercury, or by drawing it with a magnet. In *Negretti's* the tube is bent near the bulb, and the bore contracted at the bend; when the temperature falls the mercury beyond the bend detaches itself from the rest. The instrument is set by shaking the detached column past the bend.

MAY, now the fifth month in the year, but the third in the old Roman calendar, has thirty-one days. In Latin it is named *Maius*, contracted from *Magius*, from a root *mag*, or (Sanskrit) *mah*, to grow. Hence May is the season of growth, and in no way connected etymologically with *Maia*, the mother of Mercury. Numa deprived it of the odd day, which was restored to it by Julius Cæsar. The Romans regarded the month as under the protection of Apollo, and from the Lemuria being celebrated then it was deemed unlucky to contract marriages during its course—a superstition still prevalent in some parts of Europe. The ancient Saxons called it *thremeolce*, three-milk month, because cows were then milked three times a day. The profusion of flower and blossom which marks the month, and the fulness of life and beauty then prevailing, instinctively excite delight and gladness. Hence the *Floralia* of the Romans, and the May-day and Maying, more carefully and festively observed by our ancestors than by ourselves. On the 1st of May the old Celtic peoples held a festival called Beltein (see BELTEIN), but it does not seem to have been connected with flowers. Many English writers present us with pleasing pictures of the festivities of the season, such as bringing home 'the May,' or the hawthorn-bloom, and crowning the village beauty with flowers as 'the queen of May.'

MAYBOLE, a police burgh and market-town of Scotland, Ayrshire, 49 miles S.S.W. by rail from Glasgow. Although many modern improvements have been effected, the town still retains a quaint antique appearance. Among the most noteworthy buildings are the old castle, at one time the town residence of the Ailsa family; the town-house; the collegiate church; and John Knox's house, where the reformer held a famous debate with the last abbot of Crossraguel. Handloom weaving, once the staple industry, is now all but extinct, but its place has been taken by shoemaking; the large factories established here employing about 1200 hands, who turn out about 12,500 pairs of shoes weekly. Connected with some of these factories are large tanneries and currying works. The manufacture of agricultural implements is also carried on extensively. Pop. of police burgh (1881), 4474.

MAYENCE. See MAINZ.

MAYENNE, a department of France, bounded on the north by the departments Manche and Orne, east by Sarthe, south by Maine-et-Loire, and west by Ille-et-Vilaine, is of a compact and nearly rectangular shape, 56 miles long by 48 broad, and has an area of 1996 square miles. The surface, though nowhere mountainous, is much broken by hills, ravines, and valleys. The strata belong chiefly to the secondary formation, and a small coal-field near its centre is partially worked. The grain raised more than meets the consumption, but only a small portion of it is wheat. The orchards yield a good deal of cider, and considerable attention is paid both to the dairy and the rearing of cattle. Iron ore abounds, but makes a very indifferent iron. The chief manufactures are linen, particularly sailcloth and table-linen. For administrative purposes Mayenne is divided into three arrondissements—Laval, the capital, Château Goutier, and Mayenne—twenty-seven cantons, and 276 communes. Pop. in 1881, 344,881.

MAYENNE, a town, France, in the above department, and on a river of same name, 17 miles N.N.E. of Laval. It consists of the town proper on the right, and an extensive suburb on the left bank, communicating with it by a bridge, and is very indifferently built, though it contains one large square adorned with a fountain. Its principal edifices are two churches, a town-house, and a picturesque old castle, which was taken by the English in 1424 after a three months' siege. The staple manufactures are linen, calicoes, and ticks, which employ about 8000 persons in and around the town; and there are several cotton-mills, dye-works, and bleachfields. Pop. in 1881, 11,188.

MAY-FLY. See EPHEMERIDÆ.

MAYNOOTH, a market-town, Ireland, county Kildare, and 13 miles W.N.W. of Dublin, with which it is connected by railway. It has a Protestant and a Roman Catholic church, three schools, and the well-known college of St. Patrick. (See MAYNOOTH COLLEGE.) It possesses some historical interest as the seat of the once powerful Geraldines. Several struggles with the English power occurred here, especially the 'rebellion of Silken Thomas' in the reign of Henry VIII., and the war of the Confederates (1641–50). Near it are the ruins of the castle of Maynooth, built about 1176 and enlarged in 1426. Pop. in 1881, 1727.

MAYNOOTH COLLEGE was founded in 1795 by an act of the Irish Parliament, for the education of the Irish Roman Catholic clergy, who were debarred by the destruction of their seminaries in France during the revolution from prosecuting their studies in that country, as they had been accustomed to do, in consequence of the operation of the penal laws. A sum of about £8000 was annually voted for its maintenance from 1795 to 1807, when £5000 were voted to enlarge the buildings. From 1813 to 1845 the annual grant was £8928. By the act of 8 and 9 Vict. cap. XXV. (1845), the college was placed on a new footing, and permanently endowed by a grant from the consolidated fund of £26,360 a year for the maintenance and education of 500 students, and of twenty senior scholars on the Dunboyne foundation (which has been uniformly since that time the total number of students), a fund now amounting to £460 per annum, and derived from a bequest of the deceased Lord Dunboyne. Besides providing for the yearly cost of commons, &c., for these 520 students, of allowances to the 20 Dunboyne students, and to 250 students of the three senior classes, and of salaries to the president, superiors, and pro-

fessors, the act further vested in the commissioners of public works a sum of £30,000 for erecting the buildings necessary to accommodate the increased number of students. All the students are destined for the priesthood, and all are resident within the building. Applicants must be recommended by their bishops, and answer satisfactorily at a rather comprehensive entrance examination. Under the Irish Church Act of 1869 the college received in 1871 £372,276 compensation for the withdrawal of the parliamentary grants. The full curriculum is of seven years, one of which is devoted to classics, two to philosophy, and the remaining four to theology and cognate subjects. The senior students read a course of five years theology. The foundation consists of a president, vice-president, four deans, a bursar, twelve professors, a librarian, a lecturer on elocution, and an organist and lecturer on ecclesiastical music. The college buildings consist of an old and a new quadrangle, the latter a fine Gothic structure, erected by Pugin in 1846; it contains the refectory, a library of over 12,000 volumes, lecture-rooms, &c.

MAYO, a western maritime county of Ireland, in Connaught; bounded south and east by Galway, Roscommon, and Sligo, and on the north and west by the ocean; greatest length, north to south, 58 miles; greatest breadth, east to west, 72 miles, comprising an area of 2126 square miles, or 1,360,731 acres, of which 497,587 acres are arable, and 800,111 acres uncultivated; the remainder occupied by plantations, towns, and water. Its coasts are deeply indented, the principal bays being Killala Bay, Broadhaven, Blacksod, and Clew Bay. It comprises numerous islands, the largest of which are Achill, Clare, Inishturk, and Innisboffin. The county is in many parts extremely mountainous, its highest summits varying from 2370 feet to 2680 feet above the level of the sea. There is, however, also much level and fertile land. Its only river of any size is the Moy, which falls into Killala Bay. There are numerous lakes, but they are all small, with exception of Loughs Conn and Mask, the latter only partly in the county. The subsoil is limestone, red sandstone, mica-slate, granite, and quartz; iron-ore abounds, but remains unwrought; there are several valuable slate-quarries. Oats form the chief crops; and considerable quantities also of barley, bere, rye, potatoes, and turnips are grown; but pasturage is more attended to than tillage. In 1883 there were 59,074 acres under oats, 871 under wheat, 2893 under barley, bere, and rye, 52,977 under potatoes, and 9282 under turnips. The principal occupations are agriculture and fishing. The county is divided into nine baronies, and returns two members to Parliament. Principal towns, Castlebar, Ballina, and Westport. Pop. in 1841, 388,887; in 1881, 245,212.

MAYOR (French, *maire;* Latin, *major*), originally an overseer, and thence the chief magistrate of a city or corporate town in England or Ireland, to whom the title seems to have been first given by charters granted some time after the Conquest. The mayor is elected by the aldermen or councillors from among themselves, and holds office only for a year. The Mayors of London, York, and Dublin are called each 'lord-mayor;' the Lord-mayor of London having the further title of 'right honourable,' first allowed in 1354 by Edward III. The mayor is the head of the local judicature, and the executive authority for carrying the ordinances of the council into effect. In the civil government of the city of London the lord-mayor represents the sovereign. He is also the conservator of the river Thames, and on the royal demise becomes *pro tempore* a privy-councillor. An allowance of £8000 a year is made to him, with the use of the Mansion-house and its furniture, to enable him to support the dignity of his office with becoming splendour. The office is not now coveted with the same eagerness as it formerly was, when the attainment of it was the ambition of the most eminent and wealthy citizens. Charles II. in 1665 first applied the title of lord-mayor to the chief magistrate of Dublin. Mayors are *ex officio* justices of the peace during both their year of mayoralty and the following one. The chief executive officers of the cities of the United States are termed mayors, and are elected by the citizens.

MAYOTTA, or MAYOTTE, an island in the Indian Ocean, one of the Comoros, at the north-east entrance of the Mozambique Channel, ceded to France in 1843. It is surrounded with reefs, within which are several small islands, and a number of bays suitable for anchorage. It is about 30 miles long by 20 miles broad; volcanic, mostly composed of lava; mountainous, its highest summits nearly 2000 feet high, intersected by deep valleys or ravines, and well wooded. In the more level parts the soil is a deep vegetable mould of great fertility. Sugar is produced and exported. There are two villages, that of Choa or Mayotta, and that of Zaondzi, on an island of same name, one of those included within the encircling reef. Mayotta is the only refuge for French ships in the Indian Ocean. Pop., with dependencies and Ste. Marie, Madagascar (1880), 27,482.

MAZAMET, a town, France, in the department of Tarn, on the left bank of the Arnette, 32 miles S.S.E. Alby. It has a consistorial Calvinistic church; important manufactures of coarse woollens, flannels, and moleskins; worsted, paper, and fulling mills, dye-works, and a trade in corn and excellent chestnuts. Pop. (1881), 14,429.

MAZANDERAN, or MAZENDERAN, a province, Persia, bounded on the north by the Caspian, on the east by Khorasan, on the south by Irak-Ajemi and on the west by Ghilan; greatest length, east to west, about 200 miles; breadth, varying from 50 to 70 miles. It forms the greater part of the low plain which lies along the southern shores of the Caspian, but rises rapidly towards the south as it ascends the chain of the Elburz. It has no rivers of any consequence; but is watered by numerous streams, which, belonging to the basin of the Caspian, have all a northern direction. The high grounds are finely wooded, and the low plains extremely fertile. Even the sugar-cane thrives, and heavy crops of rice are everywhere grown. Cotton grows luxuriantly, and the mulberry is employed in rearing vast numbers of silk-worms. Fruit also is very abundant, and the pomegranate forms whole forests. The climate is very moist. The causeway, parallel with the shores of the Caspian, constructed by Shah Abbas the Great in the seventeenth century, extends throughout the whole province, and is still in sufficient repair to be available for travelling and traffic. Pop. 150,000.

MAZARIN, JULES (*Giulio Mazzarino*), first minister of Louis XIV. and cardinal, was born of a noble family at Piscina, in Abruzzo (according to Flassan at Rome), 14th July, 1602. He studied law at the Spanish University of Alcala de Henares, after leaving which he entered the military service of the pope. He was a captain in a corps in the Valtellina when he was commissioned by General Torquato Conti to negotiate the truce at Rivalta, Sept. 16, 1630, between the French, Spanish, and imperial generals. The Nuncio Bagni represented him as a distinguished man to Louis XIII. and Cardinal Richelieu. When the war broke out respecting the succession of the Duchy of Mantua, Mazarin, as Papal minister, repaired to Louis XIII. at Lyons, and had a long conference with Cardinal Richelieu. Mazarin gained the friendship of Richelieu, and in 1641

Louis XIII. induced Urban VIII. to create him cardinal, immediately whereupon he was appointed a member of the council of state. Richelieu on his death-bed recommended him so strongly to the king, that in his will Louis nominated him a member of the council of regency. After the death of Louis XIII. in 1643 Queen Anne of Austria, as regent, gave him the post of first minister. Mazarin was at that time generally regarded as the lover of the queen. He at first acted as a very cautious statesman. But notwithstanding this moderation a powerful party was formed against him. The people, moreover, groaned under the burden of taxes, and these circumstances resulted in a civil war. (See FRONDE.) Spain took part in the commotions, and the archduke, governor of the Netherlands, assembled troops. This obliged the queen to come to a compromise with the parliament. But the Prince of Condé, to whom the state was indebted for this reconciliation, showed little moderation to either party. Mazarin was ridiculed by him, and forced to be ungrateful; he persuaded the queen to give orders for the arrest of Condé, with his brother the Prince of Conti, and the Duke of Longueville. But in 1651 the parliament issued an edict banishing Mazarin from the kingdom, and obliged the court to release the princes. The cardinal fled first to Liége and then to Cologne; but even from thence did he rule the court and France. In February, 1652, the king now arrived at age, recalled Mazarin, who, as Voltaire says, came to France 'less like a minister resuming his office than like a ruler taking possession again of his states.' On the first information of his return Gaston d'Orleans, brother of Louis XIII., who had demanded the removal of the cardinal, levied troops in Paris, and the parliament renewed its decrees, banished Mazarin, and set a price on his head. At the same time the Prince of Condé, in league with the Spaniards, put himself in motion against the king, whose army was commanded by Turenne, who had left the Spaniards. Several indecisive battles were fought; the war ceased, and was renewed at intervals. The cardinal found it necessary again to leave the court, and repaired to Sedan in 1652, after which the king again took possession of Paris. To restore entire tranquillity Louis had issued a proclamation in which he dismissed his minister, while he praised his services, and lamented his banishment. But quiet having returned, the king invited him in February, 1653, back to Paris. Louis received him like a father, the people like a master. The princes, the ambassadors, and the parliament hastened to wait upon him. Mazarin now prosecuted the war against Spain with redoubled zeal, and for that end formed an alliance in 1656 with Cromwell. By this means he obtained for France an honourable peace. He negotiated himself in 1659 with the Spanish minister Haro on the Spanish frontier. This peace of the Pyrenees was followed by the marriage of the king with the Infanta. Both negotiations did great honour to Mazarin's policy. He was now more powerful than ever; he appeared with regal pomp, being regularly attended by a company of musketeer guards, in addition to his body-guard. The queen-mother, on the contrary, lost her influence. During this time of repose nothing was done by Mazarin for the administration of justice, for trade, naval power, and finances. Neither were his eight years of unlimited dominion marked by a single honourable institution. The finances he administered like the steward of an involved master. He accumulated above 12,000,000 livres, in doing which he often made use of means unworthy of an honourable man. Colbert advised him to make the king a present of all his treasures, who would infallibly return them to him. The king accepted the present, and the cardinal had already begun to feel uneasy, when the king returned it to him after the lapse of three days. Mazarin died March 9, 1661. His letters respecting the negotiations of the Peace of the Pyrenees, written for the information and instruction of the young king, and forming useful examples of clear and precise diplomatic writing, have been several times printed.

MAZATLAN, a town and seaport, Mexico, in the department and 183 miles south-east of Sinaloa, at the entrance into the Gulf of California. It is built on the crest of some heights, and has a clean and healthy appearance. The port is sheltered to some extent from the north winds, but exposed to the west and south. It forms the outlet for the products of the mining district of St. Sebastian, and imports considerable quantities of English goods. There are many fine warehouses, and after Acapulco, Mazatlan is the most commercial town in Mexico. Pop. 12,700.

MAZEPPA, JOHN, Hetman of the Cossacks, born about 1645 in Podolia, of one of the many poor noble Polish families who were obliged to seek for employments in the houses of the more wealthy. He was page to John Casimir, who was fond of pleasure, but at the same time a lover of the arts and of literature. Mazeppa had therefore an opportunity of acquiring various useful accomplishments. An intrigue was the foundation of his future elevation. A Polish nobleman having surprised Mazeppa with his wife, bound him naked, in revenge, upon his own horse, and committed him to his fate. The horse carried him to his own residence, not to the Ukraine, as is generally supposed. Shame made him flee to the Ukraine and join the Cossacks, whose warlike roving life suited his disposition. He made himself conspicuous and beloved by his dexterity, bodily strength, and courage. His knowledge and sagacity procured him the posts of secretary and adjutant to the hetman Samoilowitz, and in 1687 he was elected in his place. He gained the confidence of Peter the Great, who loaded him with honours, and he was finally made Prince of the Ukraine. His restless spirit now made him resolve to throw off the yoke of subordination. He joined with Charles XII., who had just given a king to Poland, and aimed, by his assistance, to withdraw himself from his allegiance to the czar, and to unite the Ukraine, under certain conditions, to the crown of Poland. These and other intrigues of Mazeppa against Peter were at last revealed to the latter by Kotschubey, general of the Cossacks, and Isra, governor of Poltawa. Peter put no confidence in these charges, but sent both the accusers to Mazeppa himself for punishment. He had the audacity to cause them to be executed. At length the eyes of Peter were opened; many partisans of Mazeppa were arrested and executed, and he himself was hung in effigy. He then went over, with a few adherents, to Charles XII., and took an active part in the unfortunate campaign in the Ukraine. After the defeat at Pultawa Mazeppa fled to Bender, where he died 22d September, 1709. Lord Byron has made Mazeppa the hero of a poem, and Horace Vernet has executed two paintings from incidents in his life.

MAZURKA, a lively Polish national dance, the movements of which are of a grotesque character. The term is also applied to the music which accompanies the dance, sometimes in $\frac{2}{4}$ time, but for the most part in $\frac{3}{4}$. The mazurka is danced by four or eight couples, and is popular almost everywhere, being as much practised in Northern Germany as it is in Poland.

MAZZARA, a town of Sicily, near the mouth of the Salemi, 25 miles south of Trapani. It is surrounded by Moorish walls flanked with small square towers and defended by an old castle, but is very

poorly built. Its principal edifices are a cathedral with a fine cupola, several other churches and convents, a bishop's palace, court-house, college, and hospital. The harbour, though capacious, is very shallow. It furnished a landing-place to the Saracens who invaded and conquered Italy, and has still a considerable export trade in corn, wine, brandy, soda, oil, &c. Cotton is extensively grown in the neighbourhood, and forms a considerable item of trade. Pop. 11,756.

MAZZINI, GIUSEPPE, unquestionably one of the most distinguished modern Italians, was born at Genoa 28th June, 1805. His father was an eminent medical practitioner, in circumstances sufficiently affluent to give his son the highest education attainable in Genoa. An accidental encounter excited in him, while quite a youth, an eager interest in some political fugitives, and roused in his breast that enthusiastic love of liberty which was the ruling passion of his after-life. He had chosen for himself the profession of the law; but the condition of Italy, both of that portion under Austrian rule, as well as of that under native despotism, diverted him irresistibly into the domain of politics. He first made literature the medium of disseminating his patriotic sentiments, and political essays under the mask of literary critiques appeared from his pen in the Indicatore Genovese, which was suppressed when this was discovered, and revived as the Indicatore Livornese, to be in its turn also soon suppressed. It at first seemed to him and his friends that a revived form of Carbonarism might furnish the elements of a *hetæria*, or a universal secret association of patriots; but the Piedmontese government having received a hint of the scheme, Mazzini was arrested, and after a short imprisonment released on the condition of quitting Italy (1831). Marseilles became his residence; and swarming as it was with Italian refugees, he found no difficulty in forming the new organization of 'La Giovine Italia,' or 'Young Italy,' and in establishing a journal with the same title, in which he advocated his views, numerous copies of it finding their way to Italy. He urged a popular insurrection and the union of all the separate states into one powerful nationality, his own preference being for a republican form of government. A conspiracy was organized, with Genoa as a centre, but it was discovered by the Piedmontese government, of which Charles Albert was now the head, and such of the active principals as failed to effect their escape were put to death or imprisoned. For fifteen years (from 1833 to 1848) Mazzini had to limit the propagandism of his ideas to the European press and to a secret correspondence with Italy. Expelled from France by the government of Louis Philippe, he removed to Switzerland, whence he attempted to precipitate an insurrection in Northern Italy; but this abortive action only secured his expulsion from Switzerland, when he removed to England. Here he continued to be recognized as the head of the 'Young Italy' party, which, still regarding him as its chief, looked to him for advice and direction. After the insurrection of Milan (March, 1848), and the evacuation of Lombardy by the Austrians, he appeared once more in Italy. From some misunderstanding between the party of Mazzini and Charles Albert the battle of Custozza (July 24, 1848) was a failure, and Austrian domination in Lombardy was restored by Radetsky. The flight of the pope in November, 1848, and the arrival of Mazzini in Rome in the following February, his presidency of the short-lived republic, his heroic defence of Rome against the French, its capture on the 3d of July, and the return of the pope in April, 1850, under French protection, are picturesque incidents of an exceptionally busy and brilliant period of his life. On the surrender of Rome he repaired to Switzerland, afterwards removing to London, whence he organized risings in Milan (1853) and in Piedmont (1857). The successful Sicilian expedition of Garibaldi in 1860 owed much of its organization to Mazzini. In September, 1866, the Italian government rescinded the sentence of death against him; in July, 1868, he was made grand-master of the Italian freemasons; in August, 1870, he was arrested at Palermo and imprisoned at Gaeta, but liberated on the 15th of October following. He died at Pisa 10th March, 1872. His collected works have been published, and contain much interesting political autobiography, such as his initiation into the society of the 'Carbonari,' and his founding of the 'Giovine Italia.' Mazzini was a man of great and varied acquirements, and wrote in French and English with elegance and facility. He was a well-known and popular contributor to the periodical literature of England.

MAZZOLA, or MAZZUOLI, GIROLAMO FRANCESCO MARIA (called *Il Parmegiano*), one of the most distinguished painters of the Lombard school, born at Parma 11th January, 1503, was the son of Filippo Mazzola, a painter, surnamed *Dell' Erbette*. In his sixteenth year he executed a Baptism of Christ, which displays his remarkable talents. Correggio's presence in Parma in 1521 gave him an opportunity of becoming acquainted with the style of that master. In 1522 Mazzola painted among other works a Madonna with the Holy Children, a St. Jerome, and a St. Bernardin of Feltri, a celebrated oil-painting, which is preserved in the monastery Della Nunziata, but which has suffered from time and unskilful hands. In Rome, which the young artist visited in 1523 with the hope of attracting the notice of the Pope Clement, the works of Raphael made a deep impression upon him, the influence of which is perceptible in his subsequent paintings, in which he aimed at a union of Correggio's grace with Raphael's expression. On the capture of Rome in 1527 he suffered great losses, and after that event went to Bologna. Among his most celebrated paintings, executed in that city, are his St. Rochus, the Madonna della Rosa (now at Dresden), and St. Margaret. He soon returned to Parma, and there executed the Cupid making a Bow, and painted several works for the church Della Steccata. But his health was feeble, and he was imprisoned by the overseers of that building, who had advanced him the money for works which he neglected to finish. Being set at liberty on condition of completing them, he fled to Casal Maggiore, where he died 24th Aug. 1540. His works are not numerous, much of his time having been wasted in the search after the philosopher's stone. With a thorough knowledge of his art Mazzola united great correctness of drawing. Algarotti and Mengs accuse him of being sometimes guilty of affectation in his attempts at grace, and Fiorillo objects to his too great use of curved lines, and to his involving the limbs. His fire, grace, correct drawing, boldness of touch, and ease of composition are undeniable. Though not the inventor of the art of etching, he was the first who introduced it into Italy.

MEAD, or METH, a favourite vinous liquor, used especially in Poland, West Prussia, and Russia, is made of honey and water by means of digestion and fermentation, and is the better in quality the better the honey is. It also receives an addition of fruit, for example, currants, cherries, raspberries, &c., and of spices and simples to give it a richer flavour. When new mead has always a strong taste of honey, but this diminishes as it becomes older. Mead is mixed with the must of apples, or with wine, beer, and even vinegar, and then takes the name of wine-mead, beer-mead, &c. The Scandinavian mead is

flavoured with primrose blossoms. Pliny ascribes to mead all of the bad, but none of the good qualities of wine.

MEADOW-GRASS. There are several species of meadow-grass, among which may be enumerated: 1. *Poa pratensis* (the smooth-stalked meadow-grass), with creeping roots, smooth stems and leaves, a short blunt ligula, lanceolate five-ribbed florets connected by a web, four-flowered spikelets, and a smooth branching panicle. It occurs naturally in meadows, and forms an important part of the hay crop. Flowering in May and June, it produces a rich early herbage; and as it has loose creeping roots, it succeeds in light soils where a species with fibrous roots would fail. 2. *Poa trivialis* (the rough-stalked meadow-grass), with fibrous roots, creeping stems, like the leaves perceptibly rough to the touch, an oblong ligula, three-flowered spikelets, lanceolate five-ribbed florets connected by a web, and a spreading branched panicle. Like the last, it is common, and its herbage, though later, is in every respect of excellent quality, being especially well adapted for water-meadows. 3. *Poa nemoralis* (the wood meadow-grass) has fibrous roots, narrow leaves rough to the touch, a short notched ligula, a spreading capillary panicle, lanceolate spikelets with each about three florets, but having no web at the base. It is found commonly in woods in the north of England, and is prized for lawns or for pastures that are kept down by close feeding. There are two varieties of this, the one brought originally from Hudson's Bay, of singularly rapid growth, and from its brilliant colour in winter called *evergreen;* and the other, the *gigantic*, differing from the common kind in size alone.

MEADOW-LARK. See LARK.

MEAL-WORM, the popular name of the larva of the *Tenebrio molitor*, found in meal and flour, and which is extensively used as an article of diet for tame and singing birds. The Tenebrio is a beetle (order Coleoptera) belonging to the section Heteromera of that order. This section is characterized by its members possessing four joints in the two anterior feet, and five joints in the feet of the four hinder legs. These beetles inhabit dark situations, and are generally nocturnal in habits. The body is of a blackish-brown colour, and averages half an inch in length. The larvæ or meal-worms possess cylindrical bodies, and are of a light tawny colour. (See Pl. LXVII.–LXVIII. figs. 4, 5.)

MEAN, a quantity having a value intermediate between those of two other quantities. The arithmetical mean between two quantities is equal to half their sum; the geometric mean between them being equal to the square-root of their product; and the harmonic mean being equal to twice their product divided by their sum. In a mathematical series containing a number of terms the means between any two given terms are those terms of the series which occur between them. The definition of the term has been extended; when a quantity has a number of values, the mean (arithmetic) or average value is the sum of the values divided by their number. *Mean anomaly* is the anomaly of a planet or comet on the supposition that it moves with a mean or average velocity. Nutation causes the obliquity of a planet to vary slightly, the mean obliquity is the average obliquity during a great length of time. The mean distance of a planet is the arithmetic mean between its greatest and least distances from the sun; it is equal to the semi-axis major of the elliptic orbit. Mean solar time (see EQUATION OF TIME) is not measured by the true sun as indicated by the sun-dial, but by what is called the mean sun.

MEANEE. See MIANI.

MEARNS, THE. See KINCARDINESHIRE.

MEASLES, also called RUBEOLA, is an infectious fever, characterized by a crimson rush made up of small dots arranged in clusters something after the form of a half-moon. It is a disease chiefly affecting children, and generally only occurs once in a lifetime. The symptoms begin to develop themselves after a period of fourteen days from exposure to the poison. These resemble very much the onset of a severe cold, namely, lassitude, cold shivers, feverishness, running at the eyes and nose, sneezing, a hard cough, and often a congested state of the throat and palate. The eyes soon become blood-shot and intolerant of light, while the symptoms of inflammatory action in the mucous membrane of the respiratory organs become intensified. On the fourth day of the fever the rush appears in blotches, crescentic in form, first upon the temples, and gradually extends over the whole surface of the body. It begins to fade about the seventh day. The complications most to be dreaded are inflammations of the mucous membranes of the eye and chest. The treatment consists in keeping the patient confined to bed in a warm room, relieving the chest by hot poultices and expectorant and demulcent remedies, and preventing constipation. During convalescence give good nourishing food.

MEASURES. See WEIGHTS AND MEASURES.

MEATH, a maritime county of Ireland, on the east coast of the province of Leinster, bounded north by Cavan, Monaghan, and Louth; east by the Irish Sea and Dublin; west by Westmeath, and south by Dublin, Kildare, and King's County. Greatest length, east to west, 47 miles; greatest breadth, north to south, 40 miles. Area, 906 square miles, or 579,861 acres, of which 532,708 are arable. The county forms the east part of the great limestone plain that extends over all the central portion of Ireland. It has only about 10 miles of coast, and no harbour of importance. The rivers are the Boyne and Blackwater; and the Royal Canal, numerous roads, and several railways, furnish ample means of internal communication. The surface is level or undulating, rising towards the west and north-west; the soil a rich loam, and, in some places, of extraordinary fertility. The land is almost entirely laid out in grass, and only sufficient oats, potatoes, and roots are grown to supply bedding and winter food for the cattle and the immediate wants of the occupiers. The small occupiers have been mostly cleared out and the land thrown into large grass farms. The condition of the occupiers who remain has been much improved. In 1883 there were under oats 31,281 acres, under wheat 1718, under barley, bere, and rye 1347 acres, under potatoes 12,183 acres, under turnips 7454, meadow and clover 77,297. Some coarse linens are manufactured, and there are one or two woollen factories. The county is divided into eighteen baronies, and returns two members to Parliament. Principal towns, Navan and Kells. Meath was one of the kingdoms into which Ireland was anciently divided, and contains the royal seat, 'Tara of the kings,' the scene of St. Patrick's first preaching of Christianity. It was also the scene of many conflicts after the English invasion, and no county abounds more in interesting relics of Irish antiquities. Numerous Celtic remains have been found along the Boyne and Blackwater. Pop. in 1841, 183,116; in 1881, 87,469.

MEAUX, a town of France, in the department of the Seine-et-Marne, on both sides of the Marne, near the Canal of Ourcq, 24 miles E.N.E. of Paris. Its principal edifices are a fine Gothic cathedral, begun about the twelfth century but never finished, an Episcopal palace, town-house, college, diocesan seminary,

the emperor conferred on him the electoral dignity of Saxony, and the greater part of the hereditary estates of the late elector. Charles now thought the moment was come to execute his project of annihilating the rights and privileges of the German princes, and rendering himself absolute master of Germany; and although he artfully maintained a show of protecting the Catholics, he laboured only for his own selfish interests. Maurice was not slow to penetrate the crafty policy of the ambitious monarch. Convinced that a forcible resistance would become necessary, he made his preparations, in 1550, under the pretence of executing the decree of the diet against Magdeburg, concluded a secret treaty with Henry II. of France and some of the German princes (1551), and behaved so warily that he had nearly succeeded in making Charles, who lay sick with the gout at Innsbruck, his prisoner (1552). In justification of this unexpected act of hostility Maurice alleged the detention of his father-in-law by the emperor, contrary to solemn promises. The emperor upon this set free the prince, whom he held captive, and proposed terms of accommodation by his brother Ferdinand. The result of this negotiation was the famous Treaty of Passau (which see), July 31, 1552. Maurice, who had thus recovered the favour of the Protestants, now thought proper to give the emperor likewise a proof of his attachment by serving against the Turks. Nothing, however, was effected, and he soon after returned to Saxony. July 9, 1553, he defeated Albert, margrave of Brandenburg-Kulmbach, who refused to accede to the Treaty of Passau, at Sievershausen, and died of a wound received in that battle two days after. Maurice possessed the talents of a great prince and general, with a prudence that enabled him to take advantage of circumstances, and although one of the least religious men of the time, the rights of Protestant and Catholic were strictly maintained. Notwithstanding the shortness of his reign Saxony is indebted to him for many useful institutions.

MAURICE, JOHN FREDERICK DENISON, a distinguished Anglican divine, the son of a Unitarian minister, was born, in 1805, at Normanston, in Suffolk. In 1823 he entered Trinity College, Cambridge, where he contracted a friendship with John Sterling, only interrupted by the death of the latter, and which was more firmly cemented by their marriage to two sisters. At the university his reputation for scholarship stood so high, and he passed his examinations with so much distinction, that he was offered a fellowship, which he declined on the ground that he could not sign the Thirty-nine Articles. In 1828 he settled in London, and applied himself to literature, his first work of any extent being Eustace Conyers, a novel, published in 1834. He also contributed, along with Sterling, to the Athenæum, then recently started by J. S. Buckingham. After the lapse of two years he experienced such a change in his religious sentiments as induced him to become not merely a member but a clergyman of the Church of England. Lest his motives in taking this step might be misinterpreted he took his degree at Oxford instead of Cambridge, and was ordained priest in 1835. In 1836 he was appointed chaplain to Guy's Hospital, a post which he kept for ten years, and which gave him a familiar acquaintance with the life of the London poor. In 1840 he became professor of modern history and English literature in King's College, London, and in 1846 professor of ecclesiastical history. In 1853 he published a volume of theological essays, one of which, containing an expression of opinion contrary to that of the unlimited duration of future punishment, was denounced as heretical by the principal of King's College, and in consequence its author was compelled to resign his chairs. In 1854 he founded the first working-man's college in London, of which he became principal. The same year he gave a series of lectures at Willis's Rooms on co-operative societies as a means of benefiting the working-classes. In 1860 he was appointed perpetual curate of St. Peter's, Vere Street, Cavendish Square, and in 1866 professor of moral philosophy at Cambridge, a position which he held until his death, which occurred 1st April, 1872. Although always looked up to as one of the leaders of the 'Broad Church' party, Maurice repudiated any sectional tendency, and disclaimed the ambition of being the founder of a religious school. Besides his active interest in all matters tending to improve the condition of the labouring classes, he devoted considerable attention to the subject of female education. Besides the books above mentioned, he published several volumes of sermons and treatises on the History of Moral and Metaphysical Philosophy, the Religions of the World, the Prophets and Kings of the Old Testament, Patriarchs and Lawgivers of the Old Testament, the Kingdom of Christ, the Doctrine of Sacrifice, Lectures on the Ecclesiastical History of the First and Second Centuries, &c. He also contributed to the Spectator and Macmillan's Magazine.

MAURICE OF NASSAU, Prince of Orange, the youngest son, by a second marriage, of William I., prince of Orange, born at Dillenburg, 14th November, 1567, was studying at Leyden, in 1584, when his father was assassinated. The provinces of Holland and Zeeland, and soon after Utrecht, immediately elected the young prince stadtholder, and his talents as a general surpassed all expectations. In 1590 he took Breda by surprise, and in 1591 Zutphen, Deventer, Nimeguen, and other places, surrendered to him. In 1593 he invested Gertruydenberg, and on May 22d, 1594, he invested Gröningen, which fell into his hands on the 24th of July. In January, 1587, assisted by some English auxiliaries, he defeated the Spaniards at Turnhout, and on 2d July, 1600, he inflicted a signal defeat on the Archduke Albert at Nieuport. With the chief command, by land and sea, of all the forces of the United Provinces, he also received the stadtholdership of Guelderland and Overyssel, that of Friesland and Gröningen being conferred on his cousin William, count of Nassau. Previous to the truce of twelve years, concluded in 1609, when Spain was compelled to acknowledge the United Provinces as a free republic, about forty towns and several fortresses had fallen into his hands. He had defeated the Spaniards in three pitched battles, besides the naval victories which were gained by the vice-admirals of the republic on the coasts of Spain and Flanders. Thus become the object of general affection and respect to his countrymen, his ambitious spirit now aimed at the sovereignty. To effect his purposes he took advantage of the religious quarrels of the Arminians and Gomarists, or the Remonstrants and Counter-Remonstrants. (See ARMINIANS.) He supported the Gomarists, even to acts of violence (see BARNEVELDT), but notwithstanding all his efforts he was compelled to abandon his project. He died at the Hague, April 23, 1625, and was succeeded by his brother Frederick Henry.

MAURICIUS, FLAVIUS TIBERIUS, one of the greatest emperors of the East, descended from an ancient Roman family settled in Asia Minor, was born at Arabissus, in Cappadocia, about 539 A.D. Though he served in the army his name does not become conspicuous in history until 578, when Justin II. intrusted him with the command against the Persians in Mesopotamia. He commenced by restoring the relaxed discipline of the troops, and after varied fortune, having nearly annihilated (581) the Persian army, on the invitation of the emperor he entered Constantinople in triumph (582). On the death of

Tiberius, in August of the same year, Mauricius ascended the throne at the mature age of forty-three. Just then the Persians broke the peace and attacked the empire. They maintained the contest with almost unvarying success till Philippicus nearly destroyed their army in 586. Incompetency or treason on the part of the imperial generals again gave the advantage to the Persians, and it was not till a commotion arose in Persia that affairs took a turn in favour of the Byzantines. Chosroes, the Persian king, being defeated by Baram, a rebel general, repaired to Hierapolis, whence he sent a letter to Mauricius, imploring his aid for the recovery of his throne. A powerful army, augmented by great numbers of loyal Persians, assembled on the frontiers, defeated the rebel Baram, and (591) restored Chosroes to the throne of his ancestors. As a reward for his timely and valuable assistance Dara and Martyropolis, the bulwarks of Mesopotamia, were given to Mauricius. Soon after, the war with the Avars was renewed, and after several campaigns, attended with less success than was expected, the Byzantines under Comentiolus, a faithless and cowardly intriguer, sustained a signal defeat, and 12,000 veteran Romans remained prisoners of war with the Avars. For the ransom of these 6000 pieces of gold were demanded, which Mauricius, actuated by powerful but secret motives, refused to pay, and the veterans were put to death by their captors. This action of the emperor was imprudent and proved his ruin, for when, in 602, he ordered his troops under Priscus to winter on the northern side of the Danube, where they would have been exposed to the attacks of the Avars, they complained that he meant to sacrifice them as he had done their 12,000 brethren, and broke out into open revolt. Electing Phocas for the chief command they marched on Constantinople, whence Mauricius fled to the provinces. Phocas arriving in Constantinople was proclaimed emperor, 23d November, 602. He immediately despatched executioners in search of his predecessor, who, with his family, had taken sanctuary in the church of St. Autonomus, near Chalcedon. They were dragged to the scaffold and executed, 27th November, 602.

MAURITANIA, or MAURETANIA, the ancient name of the north-western portion of Africa, corresponding in its area to what is now known as the Empire of Morocco and the western part of Algeria. It derived its name from its inhabitants, distinguished by the ancients as *Mauri*, a word in the Alexandrian dialect equivalent to 'Blacks.' The ancient boundary of Mauritania on the south was the Atlas. In A.D. 40 it became a Roman province. From 429 to 534 A.D. it was held by the Vandals, and in 650 A.D. it was conquered by the Arabs.

MAURITIUS, or ISLE OF FRANCE, an island in the Indian Ocean, a colony of Great Britain, lying east from the island of Madagascar; lat. (Port Louis the capital) 20° 9′ 42″ S.; lon. 57° 31′ 45″ E. It is of an oval form, about 40 miles north-east to south-west, and 25 miles in breadth, and is surrounded by coral reefs. It is composed chiefly of rugged and irregular mountains, rising usually into points of considerable height; the highest are the Montagne de la Riviere Noire, 2700 feet, and the singular isolated rock Peter Botte, 2600 feet. Between the mountains, however, and along the coast, there are large and fertile plains and valleys, having a rich soil of black vegetable mould or stiff clay, and watered by numerous streamlets, many of which become periodically dry. The climate is pleasant during the cool season, but oppressively hot in summer, and the island is occasionally visited by severe epidemics, one of which in 1867 carried off 30,000 of the population. When discovered the island was almost entirely covered with wool, a considerable part of which has now been cut down, although some extensive forests still remain. Some of the trees are very valuable, particularly the black ebony, esteemed the most solid, close, and shining of any in the world. In the general character of its vegetation Mauritius is somewhat similar to that of the Cape in the number of succulent plants, cactuses, spurges, aloes, house-leeks, fig-marigolds, &c. Many plants introduced from Europe, Africa, Madagascar, and India thrive well. Shady groves of mango, dense masses of mimosa, and nearly every beautiful tropical tree are met with here. The principal objects of cultivation are sugar, rice, maize, manioc, and vegetables; and to a limited extent coffee, pepper, and the mulberry for the production of silk. The exports of sugar, which is the staple, amounted in 1875 to 87,449 tons; in 1881 to 112,118 tons; value respectively £1,959,168 and £3,184,629. The value of the exports in 1875 was £2,522,099; in 1881, £3,477,[illegible]; of the imports in 1875, £2,194,824; in 1881, £2,029,971. The imports consist of rice, wheat, cattle, cotton goods, haberdashery, hardware, &c. The government is vested in a lieutenant-governor and legislative council, subordinate to the orders of the sovereign in council. The revenue for 1881 was £781,391, and the expenditure was £760,017. The chief sources of revenue are the customs and licenses on trades and professions; the expenditure is chiefly on the civil service and on the railways, two separate lines of which, having a total length of 87 miles, now cross the island. Mauritius was discovered in 1505 by the Portuguese. The Dutch took possession of it in 1598, and named it Mauritius, in honour of Prince Maurice. It eventually fell into the hands of the French, from whom it was captured by the British in 1810, and definitively ceded to them in 1815. In December, 1854, it was made the seat of a bishopric. Principal towns are Port Louis and Malebourg. Estimate pop. 31st December, 1881, 359,419, a great portion of whom were originally coolies imported to work the sugar estates.

MAURY, MATTHEW FONTAINE, LL.D., a distinguished American naval officer and hydrographer, was born in Virginia, January 14, 1807, and entered the United States navy in 1824. During a voyage round the world in the *Vincennes* frigate he commenced a treatise on navigation which was long used as a text-book in the navy. He was made lieutenant in 1836. He was always a studious man, and possessed great powers of application; but it was not till 1839, when he was lamed by an accident, that he quitted active service afloat for scientific work at the Washington Observatory. His powers of application were combined with rare gifts of imagination, and a style elevated almost to the poetic; so that when his observations had furnished him with the materials for his Physical Geography of the Sea, it was pronounced to be one of the most fascinating books in the language, though now many of its theories are admitted to be quite erroneous. In 1844 he produced his works on the Gulf Stream, Ocean Currents, and Great Circle Sailing. His wind and current charts have been practically beneficial to an extent that cannot easily be estimated. He projected the maritime conference at Brussels in 1853; and in 1855, having now the rank of commander, he published Letters on the Amazon and Atlantic Slopes of South America. In 1861, when the Southern States seceded from the Union, Maury adopted the side of his state, and resigned his appointment at the Washington Observatory. Russia and France both attempted to secure his services, but he remained true to his state till hope was gone. He for some time attached himself to the fortunes of

the Archduke Maximilian in Mexico; but for the last few years of his life he occupied the position of a professor at the College of Lexington in Virginia. Here he died 1st February, 1873. He was among the first to turn attention to a branch of scientific investigation which had been previously much neglected, the investigation, namely, of the depths of the sea, its currents, temperature, &c., a subject which is now considered of the utmost importance. At his death Maury held the rank of captain.

MAUSOLEUM (Greek, *mausoleion*), from Mausolus, a king of Caria, to whom a sumptuous sepulchre was raised by his wife Artemisia, at Halicarnassus. King Mausolus is said to have expired in the year 353 B.C.; and his wife was so disconsolate at the event that she drank up his ashes, and perpetuated his memory by the erection of this magnificent monument which became so famous as to be esteemed the seventh wonder of the world, and to give a generic name to all superb sepulchres. From Pliny we learn that its entire height was 140 feet, and the entire circuit 411 feet. The sculptors employed to adorn it were Scopas, Bryaxis, Timotheus, and Leochares. It was overthrown, probably by an earthquake, between the twelfth and fifteenth centuries; and when the knights of Rhodes took possession of Halicarnassus in 1404 they availed themselves of the materials of the mausoleum to erect the fortress of San Pietro. While excavating they discovered a large chamber enriched with marble pilasters, and richly inlaid panels. In another hall they discovered the sarcophagus of the founder. Many of the sculptures have recently been brought to light by the excavations of Mr. Newton of the British Museum. These consist of statues, bassi-rilievi, columns, &c., broken and fragmentary, which were collected and sent to England. Among other restorations the experts of the British Museum succeeded in piecing together, from more than sixty fragments, a draped statue, 10 feet high, of Mausolus himself. The rilievi form an entire length of upwards of 80 feet of frieze. Not only has the actual site been discovered, but the extent, dimensions, and character of the edifice have been elucidated with sufficient clearness to enable a competent architect to present us with a ground-plan and elevation of the entire mausoleum. Other famous mausoleums are, that erected at Babylon by Alexander the Great in honour of Hephæstion, equally magnificent with that of Mausolus, though less refined. A description of it is given by Diodorus (xvii. 115). The mausoleum of Augustus, built by him in the sixth consulate on the Campus Martius, between the Via Flaminia and the Tiber, the ruins of which are still seen near the church of St. Roque. One of the obelisks which stood before this superb building was found in the reign of Pope Sixtus V., and placed before the church of St. Maria Maggiore. This mausoleum contained the ashes of Augustus, Marcellus, Agrippa, Germanicus, and of some later emperors. The *Mausoleum Hadriani* is now the castle of St. Angelo.

MAUVEINE, another name for magenta (which see).

MAVROCORDATO, ALEXANDER, PRINCE, a Greek politician and diplomatist, was born at Constantinople, 11th February, 1791. After receiving an excellent education, and having become an accomplished linguist, in 1817 he undertook the duties of secretary to his uncle John Caradja, hospodar of Walachia. In 1821 he took an active part in the Greek contest for independence. As president of the General Assembly of Epidaurus he prepared the declaration of independence, and promulgated the provisional constitution in December of the same year. On the 1st of January, 1822, he was elected president of the executive council; and being invested with the chief command, he led an expedition to Epirus, which resulted in the unsuccessful battle of Peta. In the summer of this year he met Lord Byron at Missolonghi, from whom he received material aid for the prosecution of the contest. His bold and resolute defence of Missolonghi, from November 1822 to January 1823, saved the Peloponnesus. Unwilling to enter into a struggle with Colocotronis, whom he accused of ambitious views, and feeling himself powerless to re-establish union between the divided chiefs, he divested himself of the title of president, accepting, however, the post of secretary of the executive. Becoming greatly involved in political strife he withdrew from the Morea; but he exerted himself indefatigably to obtain for the Greeks the protection of England. Though opposing strenuously the pro-Russian policy of Capo d'Istrias, he did not hesitate, under his government, to accept a mission to Crete, and busy himself actively with the arming of the Grecian fleet. After the protecting powers placed Otho on the throne of Greece Mavrocordato, though dissatisfied with this procedure, undertook the duties of minister of the finances; but he soon confined himself to diplomacy, and was ambassador successively at Munich, Berlin, and London. In 1840 he made an unsuccessful attempt to form a ministry. During the insurrection of 1843–44 he was president of the Constitutional Assembly; and after Otho swore to the constitution, on the 30th March, he became president of the council, an office from which he soon retired. In 1850 he went as ambassador to Paris, and on the outbreak of the Crimean war he was once more placed at the head of the government. This dignity he resigned in 1856, and withdrew altogether into private life, though continuing to take a deep interest in promoting education. He died at Ægina, August 18, 1865.

MAXEN, a village in the circle of Meissen, kingdom of Saxony, 9 miles S.S.E. of Dresden, famous for the surrender of the Prussian General Finck, with 12,000 men, to the Austrian General Daun, Nov. 21, 1759, in the Seven Years' war. It has mineral baths. Pop. 717.

MAXENTIUS, M. AURELIUS VALERIUS, a Roman emperor, son of Maximianus, was, A.D. 306, proclaimed Augustus by the prætorians, and acknowledged by the people and senate of Rome, to whom Galerius had become hateful. Severus was sent by Galerius against him and his father, who had joined him; but Maximianus compelled Severus, who had marched upon Rome, to retreat to Ravenna, and having got him into his power, put him to death in 307. Galerius now marched in person against Rome, but was likewise compelled to retreat. Maxentius afterwards availed himself of an insurrection of the Africans under a certain Alexander, in 311, to declare war against Constantine the Great, giving out that his object was to avenge his father's death. While Constantine pressed forward into Italy and defeated the captains of Maxentius at Turin and Verona, Maxentius himself remained inactive at Rome, and did not go out to meet Constantine till he had passed unopposed across the Apennines. At the great battle which was fought shortly after, October 27, 312, at Saxa Rubra near Rome, Maxentius was defeated, and perished in the Tiber as he tried to escape over the Mulvian Bridge.

MAXILLA (Latin, *maxilla*, a jaw), the term applied in comparative anatomy to the upper jaw-bones of Vertebrates, in contradistinction to the mandible or lower jaw; and in Invertebrata to the second or lesser pair or pairs of jaws. Thus in insects, spiders, crustaceans, &c., the maxillæ form definite and important organs in the trituration and division of food.

In insects one pair of maxillæ exists, these organs being furnished with one or more pairs of *palpi* or organs of touch, known as *maxillary palpi*. The lower lip or *labium* (which see) in insects is typically composed of a second united pair of maxillæ, which also bear palpi—the *labial palpi*. In the higher Crustacea two pairs of maxillæ exist; and in the higher Arachnida (for example, spiders and scorpions) a single pair only is present, each maxilla being provided with a long palp, which in the female spiders bear pointed claws, and in the males subserve some part of the reproductive process. In the Scorpions the maxillary palps terminate in pincer-like claws or *chelæ*. In the Myriapoda (centipedes and millepedes) maxillæ are also present, but undergo modification throughout the class.

MAXIMIANUS I., M. AURELIUS VALERIUS, Roman emperor (286–305), born of humble parents in Pannonia, had so approved himself by his services in the army that Diocletian selected him for his colleague, creating him first Cæsar (285), then Augustus (286), and at the same time conferred on him the honorary appellation of Herculius. Maximianus had the care of the Western Empire, while Diocletian undertook that of the Eastern. In 287 he was consul along with Diocletian, and in the same year conducted a campaign in Gaul. In the following year he was a colleague in the consulship with Pomponius Januarius. After conducting several wars, in 303–304 he was for the seventh time made consul, having for his colleague Diocletian for the fifth time, with whom he abdicated, 1st May, 305. In the following year he was again invested with the imperial title by his son Maxentius, to whom his services against Severus and Galerius were of the most important kind. His son shortly after expelled him from Rome, when, repairing to Gaul, he found a refuge with Constantine, who had married his daughter Fausta. In 308 he caused himself to be proclaimed Augustus at Marseilles, but Constantine easily deposed him. Having attempted to induce Fausta to destroy her husband, Constantine compelled him to strangle himself, Feb. 310.

MAXIMILIAN I., Emperor of Germany, son and successor of Frederick III., born 22d March 1459, married, 20th August, 1477, Mary of Burgundy, heiress of Duke Charles the Bold, the son of which marriage (the Archduke Philip), was the father of Charles V. and Ferdinand I. Maximilian was elected King of the Romans in 1486, and ascended the imperial throne in 1493, under very unfavourable circumstances. Germany, under the reign of his predecessor, had become distracted and feeble. Maximilian's marriage had, indeed, brought the territories of Charles to the house of Austria; but he had been stripped of them by the policy of Louis XI., to whose son, the dauphin, afterwards Charles VIII., Margaret, the daughter of Maximilian, had been betrothed, giving as her dowry Artois, Flanders, and the Duchy of Burgundy. But Charles having obtained the great province of Bretagne by marrying the heiress Anne, to whom Maximilian had been married by proxy, sent back Margaret to her father. Maximilian, incensed at this double affront, took up arms, but a peace was concluded at Senlis in 1493, and Artois, Flanders, and Burgundy, were restored to Germany. In 1494 Maximilian was married a second time to Bianca Sforza of Milan. Maximilian was enterprising, politic, brave, and of a noble and generous temper; yet his best plans often failed through his excessive ardour and his want of perseverance, and the miserable administration of his finances often deprived him of the fruits of his most fortunate enterprises. He could not prevent the separation of Switzerland from the German Empire in 1498 and 1499; and his plans for limiting the power of Louis XII. in Italy, and compelling him to renounce his claims on Milan, involved him in perpetual wars, without securing to him the possession of Milan. Not less unsuccessful was the League of Cambray against Venice, which he concluded (1508) with the pope, Spain, France, Mantua, and Modena. (See LEAGUE.) Maximilian afterwards took the field against France; and for the purpose of raising money, ceded Verona to the Venetian Republic for 200,000 ducats. His measures in the domestic affairs of the German Empire, which for 300 years had been the theatre of barbarism and anarchy, were more creditable. What his predecessors had so long vainly attempted Maximilian successfully accomplished. In 1495 he had put an end to internal troubles and violence by the perpetual peace of the empire, decreed by the Diet of Worms. (See GERMANY—History.) To supply the defects of the German laws and prevent the gross abuses of justice, he adopted, at the same diet, the Roman and canon laws, as subsidiary authorities, in the decision of differences, and instituted the imperial chamber (see CHAMBER, IMPERIAL) as the supreme tribunal of the empire. He put a stop to the monstrous abuses of the Westphalian *Femgerichte*, although he was unable entirely to abolish those secret tribunals. (See FEMGERICHTE.) The institution of the German circles, which were intended to secure internal peace and safety, originated from him, as did many other useful institutions for the improvement of the government, and the promotion of science and art. He reformed the public law of Germany, created German military discipline, and was the first to establish a standing army with infantry, cavalry, and artillery. By peaceful means he increased his hereditary dominions; for the marriage of his son Philip with the Infanta Juana, and of his daughter Margaret with the Infant Juan of Spain, brought about the union of Spain with Austria; while he secured the reversion of Hungary and Bohemia to his posterity by the double marriage of his grand-daughter and grandson with the son and daughter of King Ladislaus. Maximilian was himself a poet, and was the author of a circumstantial but romantic account of his own life, though the work was really written by his private secretary Marx Treizsaurwein von Erentreiz. It was first published in 1775, in folio, under the title Der weiss Kunig, with wood-cuts by Hans Burgkmair. Maximilian died at Wels, in Upper Austria, 12th January, 1519, and was succeeded by Charles V.

MAXIMILIAN, Emperor of Mexico, known in his earlier life as FERDINAND MAXIMILIAN JOSEPH, Archduke of Austria, born at Vienna, 6th July, 1832, was the second son of the Archduke Francis Charles, and younger brother of Francis Joseph I., emperor of Austria. After receiving a careful education he entered the Austrian navy in 1846, and after holding various subordinate commands he obtained the rank of rear-admiral, and was placed at the head of the Austrian marine. Quitting the naval service he was appointed governor of the Lombardo-Venetian Kingdom, February, 1857, and on the 27th of the following July he married the Princess Charlotte of Belgium, daughter of King Leopold I. He discharged the duties of his governorship with so much care and judgment that he was deservedly popular. On his return from a voyage made to Brazil for scientific purposes he fixed his residence at Miramar, in the vicinity of Trieste, and there, October 3d, 1863, he received a deputation from the Mexican Assembly of Notables, who offered him the crown of their country, in virtue of a decree of 10th July preceding. These notables, however, were merely puppets in the hands of the French, who had inter-

fered in the affairs of Mexico. Considerations of duty and the romantic ardour of his disposition induced him to accept the offer, on the conditions that his brother should sanction his choice, and that he should have evidence that the people were in his favour. His scruples having been overcome, and having conditionally renounced his rights as an Austrian prince, he formally accepted the Mexican crown, 10th April, 1864. Embarking in an Austrian frigate a few days later he landed at Vera Cruz on the 29th of May, and entered Mexico on the 12th of June. Both Maximilian and the empress were extremely popular. He set himself energetically to consolidate and develop his dominions, granted an amnesty to political offenders, and exhibited a parental solicitude in the matters of faith, worship, and education. But he failed to conciliate the Republican party, or to induce them to acquiesce in the form and personality of a government forced on the country by France; and as he could not restore to the clergy their confiscated estates they pronounced him a traitor. Meanwhile there were incessant conflicts between the partisans of President Juarez and the allied French and Imperial troops; and the decree of October 3d, 1865, in virtue of which the members of the Juarist bands and those who abetted them were shot, alienated the party of the Liberals. Juarez raised the standard of independence, and came into collision with the French troops; jealousies and misunderstandings arose with Bazaine; the impatience of the French people under the cost of the expedition, and the representations of the cabinet of Washington, which reprobated the idea of European interference in attempting to establish a monarchy on the continent of North America, and urged the Emperor Napoleon to withdraw his troops;—all these complications and misfortunes thickening around Maximilian rendered his position critical in the extreme. The empress in vain undertook a mission to Europe to enlist support for her husband, and grief and disappointment overthrew her reason. The French were forced to retire; but Maximilian, in compliance with the prayer of a Convention of Notables, decided to remain, in the hope of being able to maintain the empire. While bravely defending Queretaro against a Liberal force under Escobedo, he was betrayed by General Lopez on the night of May 14th, 1867. By order of the Liberal minister of war he was, along with two of his generals, tried by court-martial, and condemned to be shot. The representations and protests of the various European powers against this breach of the laws of civilized warfare failed to arrest the execution of the sentence, which was carried into effect at seven in the morning of July 19th. His body was after some delay surrendered to his relatives, and his funeral was celebrated with great pomp in the cathedral of Vienna, on the 18th of January, 1868. Maximilian was a man of eminent abilities, and high and varied culture. His collected writings are contained in a posthumous publication entitled Aus Meinem Leben: Reiseskizzen; Aphorismen; Gedichte (four vols. 8vo, Leipzig, 1867), which gives ample testimony to the vigour of his intellect, the variety of his attainments, his good sense, candour, and generosity.

MAXIMINUS, Caius Julius Verus, the son of a peasant of Thrace, was originally a shepherd, and by heading his countrymen against the frequent attacks of the neighbouring barbarians and robbers, inured himself to the labours and to the fatigues of a camp. He entered the Roman army under Septimus Severus before 210, and gradually rose to the first offices. On the death of Alexander Severus, slain in a mutiny of his troops excited by Maximin, he caused himself to be proclaimed emperor, A.D. 235, and immediately made his son his colleague. The popularity which he had gained when general of the armies was at an end when he ascended the throne. He delighted in acts of barbarity, and no fewer than 400 persons lost their lives on the false suspicion of having conspired against the emperor's life. Some were exposed to wild beasts; others expired by blows; some were nailed on crosses; while others were shut up in the bellies of animals just killed. The patricians were peculiarly the objects of his cruelty, as if they were more conscious than others of his mean origin. In an expedition in Germany he cut down the corn, and laid waste about 450 miles with fire and sword. Such a monster of tyranny at last provoked the people of Rome. The Gordians were proclaimed emperors; but their pacific virtues were unable to resist the fury of Maximin. After their fall the Roman senate invested twenty of their number with the imperial dignity, and intrusted to their hands the care of the republic. These measures so highly irritated Maximin that at the first intelligence he howled like a wild beast, and almost destroyed himself by knocking his head against the walls of his palace. When his fury was a little abated he marched to Rome, resolved on slaughter, but his soldiers, ashamed of accompanying a tyrant whose cruelty had procured him the names of *Busiris*, *Cyclops*, *Phalaris*, *Sciron*, *Typhon*, or *Gyges*, assassinated him in his tent before the walls of Aquileia, A.D. 238. He was then in the sixty-fifth year of his age. The news of his death was received with the greatest rejoicings at Rome; public thanksgivings were offered, and whole hecatombs flamed on the altars. Maximin has been represented by historians as of a gigantic stature; he was 8 feet high, and the bracelets of his wife served as rings to adorn the fingers of his hand. His voracity was as remarkable as his corpulence: he ate 40 pounds of flesh a day, and drank eighteen bottles of wine. His strength was proportionable to his gigantic shape; he could draw a loaded waggon; with a blow of his fist he often broke the teeth in a horse's mouth, or broke its leg with a kick, and he could cleave young trees with his hand. But some deductions must be made from the statements of ancient writers.

MAXIMUM, the greatest value of a variable quantity. It is not, however, applied merely to the absolute greatest value, but to the value at any time when it ceases to increase and begins to decrease. The analytic method of finding the maximum and minimum values of variable mathematical quantities is of importance in the differential calculus.

MAXIMUM DENSITY OF WATER. As a general rule, to which water is a notable exception, bodies expand regularly as they get warmer. Now if water is substituted for mercury in a thermometer, it may be heated and cooled and its volume and temperature observed. It is found to contract as it is cooled until the temperature of 4° C. is reached; this is the point of its maximum density, for on continuing the cooling process it expands. Some of M. Despretz's results are given in the following table:—

Water at 4° C. has a density = 1.

Temp.	Density.	Temp.	Density.	Temp.	Density.
− 9° C.	0·998371	2° C.	0·999966	10° C.	0·999731
− 7	0·998865	3°	0 999999	20°	0 998213
− 5	0·999302	4°	1 000000	40°	0 992319
− 3	0·999577	5°	0·999999	60°	0 983303
− 1	0·999786	6°	0·999969	80°	0·971959
0	0·999873	7°	0 999929	100°	0·958634
1	0·999927	8°	0·999878		

In every case the water was only subjected to the pressure of one atmosphere. In this table the density of

enable a couple to come into action turning the body further from its old position; the equilibrium in this case was *unstable*. When the couple which comes into action on a slight displacement of a body from its position of equilibrium tends to return it to that position, the equilibrium is said to be *stable*. When there is no such couple the equilibrium is neutral. See also STABILITY.

In ordinary works on statics, when large bodies are acted on by forces, they are supposed to be rigid, that is, all their parts retain invariable positions with respect to each other. Now in reality when forces act upon bodies they deform or tend to break them. In the experimental proof of the laws of parallel forces, the wooden rod to which the forces are applied bends and may break if the forces are great enough. The internal stresses of a communicator of force produce strains or deformations of the communicator. It is found by exact observation that when we push a body by means of a rod, or pull it by means of a string, the rod or string is shortened or lengthened by a small amount, however small the exerted forces may be. If the stresses which deform any body are not too great, it is found that when they no longer act the body returns to its old form. The particles of a body are kept in their places by the attraction of *cohesion* (which see). When any force tends to separate two particles which are very near to one another, cohesion tends to prevent such separation. The force of cohesion resists any deformation or change of volume of a body, and causes it to return to its old shape and volume when no longer subjected to stresses. Liquids and gases offer no resistance to stresses tending to change their shape unless these are very suddenly applied (see MATTER); but they resist stresses tending to diminish their volumes. See ELASTICITY, MODULUS OF ELASTICITY, LIQUIDS (COMPRESSIBILITY OF). Many of the higher parts of the subject of mechanics are treated of in separate articles: GYRATION (RADIUS OF), GYROSCOPE, OSCILLATION (CENTRE OF), MOMENT OF INERTIA, CENTRAL FORCES, POTENTIAL, VIRTUAL VELOCITY, STABILITY, &c. The best complete treatise is Thomson and Tait's Natural Philosophy, vol. i.

MECHANISM. Anything which changes one form of energy into another may be called a machine; mechanism treats of those arrangements of machinery by means of which a body, acted on by a certain force and moving in a particular path, communicates mechanical work to another body in such a way that it exerts a certain force and moves in another particular path. Mechanism generally consists of combinations of the mechanical powers. (See LEVER, PULLEY, WHEEL AND AXLE, INCLINED PLANE, WEDGE, SCREW.) The steam-engine affords a source of mechanical work for use in mills and factories, it gives rotation to a shaft. We shall confine our attention to the various methods of transforming the motion of this shaft into uniform and variable motions, in straight and circular and other paths. Mechanism, as thus limited, is a part of the subject of kinematics. In causing one revolving shaft to turn another, spur and bevel wheels are usually employed. Four spur-wheels are shown in fig. 17, Pl. CXXIV., they are fixed firmly to cylindric shafts, which rest in proper bearings, and are merely capable of turning on their axes. The teeth on the circumference of a driving-wheel lock into the teeth of a follower in such a way that when the driver turns the follower must turn also. The second shaft may drive a third, and so on. It is easy to see that in a train of wheels the following law holds:—If D_1, D_2 &c., are the numbers of teeth in the drivers, and if F_1, F_2, &c., are the numbers of teeth in the followers, then the number of revolutions made by the first driving shaft in any time is to the number of revolutions of the last following shaft in the same time as the product of $F_1 \times F_2 \times$ &c., is to the product $D_1 \times D_2 \times$ &c. That the teeth of wheels may work smoothly together their curved surfaces must be mathematical, and hence they are always formed according to certain rules. Two spur-wheels may be represented by two circles rolling on one another; these are called the *pitch circles* of the wheels. The pitch of a tooth is the distance from the centre of one tooth to the centre of another measured along the pitch circle. Bevel-wheels enable one shaft to turn another making an angle with the first; two are shown in fig. 23 connecting shafts at right angles to one another. They may be represented by two cones rolling on each other, the vertices of the cones being at the point of intersection of the axes of the shafts; it may be observed that all the straight lines of the teeth would meet at this point of intersection. When the following shaft is to be driven very rapidly the driving-wheel is made large and the follower small. The law for a train of bevel-wheels is evidently the same as for a train of spur-wheels. An endless belt or rope may pass round the circumferences of two discs or pulleys keyed on two shafts to communicate motion. The number of revolutions of the driving pulley in any time is to the number of revolutions of the follower in the same time as the circumference or diameter of the follower is to the circumference or diameter of the driver. In fig. 24 on one shaft is fixed a screw, and on another, at right angles to the first, is fixed a wheel; the thread of the screw works into the teeth of the wheel; if the screw is single-threaded, for every revolution of the screw the circumference of the wheel moves through a distance equal to the pitch; therefore, as there are fifty-nine teeth in the wheel, the wheel-shaft makes one revolution for every fifty-nine revolutions of the screw-shaft. The combination of all pieces of mechanism employed for a common object in a machine is sometimes called *gearing* or *gear*. Wheels are said to be *in gear* or *out of gear* when they are capable or have been rendered incapable of moving one another.

The circular motion of a point at the end of a rotating arm (a *crank*) is changed into straight-line motion by connecting it (by means of a *connecting-rod* or *link*) with a body constrained by guides to move in a straight line. Straight-line motion may be changed into circular by means of the same mechanism, which is in constant use in steam-engines to change the reciprocating straight-line motion of the piston in the circular motion of a shaft. When a thick plate of any curved shape (a *cam*) is fixed like a wheel on a shaft, any body constrained to lie and slide on the circumference of the plate will get a motion to or from the centre of the shaft, which will depend on the shape of the plate or cam. Cams are in constant use in many forms apparently different in principle. The eccentric, the swash-plate, cams employed in punching and shearing machines, the revolving heart, the screw cam, the frisket-plate cam and Applegarth's cam of printing-machinery, Napier's cam, the expansion and exhaust tappets of steam-engines, and the cam of Breguet's telegraph manipulator, may be mentioned. Escapements (which see) convert the circular motion of a wheel into the reciprocating motion of a pendulum. Many other contrivances for converting circular into straight-line motion are in use, the screw (which see), the rack and pinion, and others; they are of great importance in self-reversing machines, and indeed in machines generally. *Link motion* is the name given to mechanism consisting of two cranks and a connecting-rod or link. The cranks may have reciprocating motions of a very varied character. The straight-line motion of the piston of a steam-engine is usually transformed

MECHANICAL POWERS.

Fig. 14

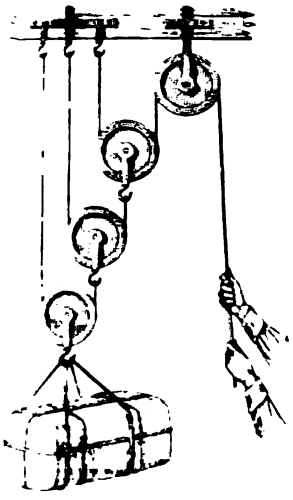


Fig. 15

Fig. 16

Fig. 17

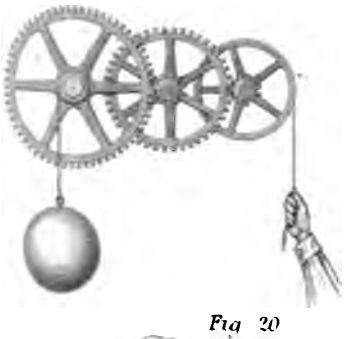


Fig. 18

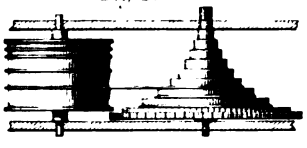


Fig. 19.

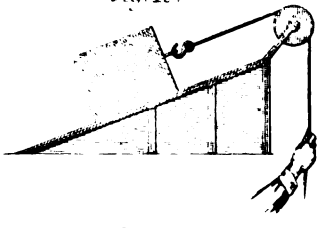


Fig. 20

Fig. 21.

Fig. 22.

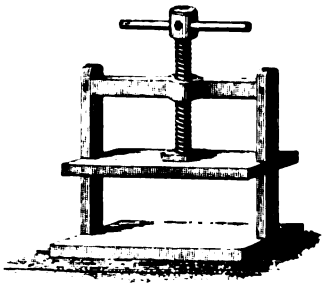


Fig. 23.

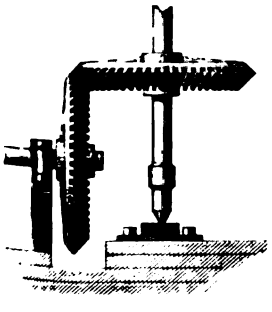


Fig. 24.

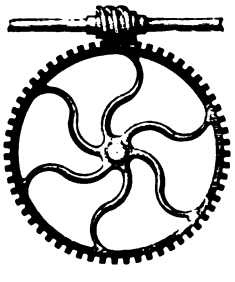
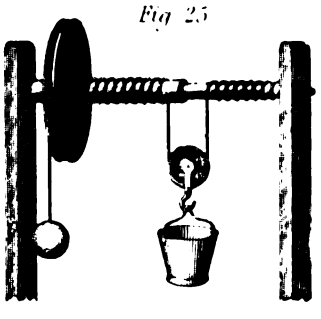


Fig. 25



Copied with permission from W. & A. K. Johnston's Illustrations of Natural Philosophy.

BLACKIE & SON, GLASGOW, EDINBURGH & LONDON

enable a couple to come into action turning the body further from its old position; the equilibrium in this case was *unstable*. When the couple which comes into action on a slight displacement of a body from its position of equilibrium tends to return it to that position, the equilibrium is said to be *stable*. When there is no such couple the equilibrium is neutral. See also STABILITY.

In ordinary works on statics, when large bodies are acted on by forces, they are supposed to be rigid, that is, all their parts retain invariable positions with respect to each other. Now in reality when forces act upon bodies they deform or tend to break them. In the experimental proof of the laws of parallel forces, the wooden rod to which the forces are applied bends and may break if the forces are great enough. The internal stresses of a communicator of force produce strains or deformations of the communicator. It is found by exact observation that when we push a body by means of a rod, or pull it by means of a string, the rod or string is shortened or lengthened by a small amount, however small the exerted forces may be. If the stresses which deform any body are not too great, it is found that when they no longer act the body returns to its old form. The particles of a body are kept in their places by the attraction of *cohesion* (which see). When any force tends to separate two particles which are very near to one another, cohesion tends to prevent such separation. The force of cohesion resists any deformation or change of volume of a body, and causes it to return to its old shape and volume when no longer subjected to stresses. Liquids and gases offer no resistance to stresses tending to change their shape unless these are very suddenly applied (see MATTER); but they resist stresses tending to diminish their volumes. See ELASTICITY, MODULUS OF ELASTICITY, LIQUIDS (COMPRESSIBILITY OF). Many of the higher parts of the subject of mechanics are treated of in separate articles: GYRATION (RADIUS OF), GYROSCOPE, OSCILLATION (CENTRE OF), MOMENT OF INERTIA, CENTRAL FORCES, POTENTIAL, VIRTUAL VELOCITY, STABILITY, &c. The best complete treatise is Thomson and Tait's Natural Philosophy, vol. i.

MECHANISM. Anything which changes one form of energy into another may be called a machine; mechanism treats of those arrangements of machinery by means of which a body, acted on by a certain force and moving in a particular path, communicates mechanical work to another body in such a way that it exerts a certain force and moves in another particular path. Mechanism generally consists of combinations of the mechanical powers. (See LEVER, PULLEY, WHEEL AND AXLE, INCLINED PLANE, WEDGE, SCREW.) The steam-engine affords a source of mechanical work for use in mills and factories, it gives rotation to a shaft. We shall confine our attention to the various methods of transforming the motion of this shaft into uniform and variable motions, in straight and circular and other paths. Mechanism, as thus limited, is a part of the subject of kinematics. In causing one revolving shaft to turn another, spur and bevel wheels are usually employed. Four spur-wheels are shown in fig. 17, Pl. CXXIV., they are fixed firmly to cylindric shafts, which rest in proper bearings, and are merely capable of turning on their axes. The teeth on the circumference of a driving-wheel lock into the teeth of a follower in such a way that when the driver turns the follower must turn also. The second shaft may drive a third, and so on. It is easy to see that in a train of wheels the following law holds:—If D_1, D_2, &c., are the numbers of teeth in the drivers, and if F_1, F_2, &c., are the numbers of teeth in the followers, then the number of revolutions made by the first driving shaft in any time is to the number of revolutions of the last following shaft in the same time as the product of $F_1 \times F_2 \times$ &c., is to the product $D_1 \times D_2 \times$ &c. That the teeth of wheels may work smoothly together their curved surfaces must be mathematical, and hence they are always formed according to certain rules. Two spur-wheels may be represented by two circles rolling on one another; these are called the *pitch circles* of the wheels. The pitch of a tooth is the distance from the centre of one tooth to the centre of another measured along the pitch circle. Bevel-wheels enable one shaft to turn another making an angle with the first; two are shown in fig. 23 connecting shafts at right angles to one another. They may be represented by two cones rolling on each other, the vertices of the cones being at the point of intersection of the axes of the shafts; it may be observed that all the straight lines of the teeth would meet at this point of intersection. When the following shaft is to be driven very rapidly the driving-wheel is made large and the follower small. The law for a train of bevel-wheels is evidently the same as for a train of spur-wheels. An endless belt or rope may pass round the circumferences of two discs or pulleys keyed on two shafts to communicate motion. The number of revolutions of the driving pulley in any time is to the number of revolutions of the follower in the same time as the circumference or diameter of the follower is to the circumference or diameter of the driver. In fig. 24 on one shaft is fixed a screw, and on another, at right angles to the first, is fixed a wheel; the thread of the screw works into the teeth of the wheel; if the screw is single-threaded, for every revolution of the screw the circumference of the wheel moves through a distance equal to the pitch; therefore, as there are fifty-nine teeth in the wheel, the wheel-shaft makes one revolution for every fifty-nine revolutions of the screw-shaft. The combination of all pieces of mechanism employed for a common object in a machine is sometimes called *gearing* or *gear*. Wheels are said to be *in gear* or *out of gear* when they are capable or have been rendered incapable of moving one another.

The circular motion of a point at the end of a rotating arm (a *crank*) is changed into straight-line motion by connecting it (by means of a *connecting-rod* or *link*) with a body constrained by guides to move in a straight line. Straight-line motion may be changed into circular by means of the same mechanism, which is in constant use in steam-engines to change the reciprocating straight-line motion of the piston in the circular motion of a shaft. When a thick plate of any curved shape (a *cam*) is fixed like a wheel on a shaft, any body constrained to lie and slide on the circumference of the plate will get a motion to or from the centre of the shaft, which will depend on the shape of the plate or cam. Cams are in constant use in many forms apparently different in principle. The eccentric, the swash-plate, cams employed in punching and shearing machines, the revolving heart, the screw cam, the frisket-plate cam and Applegarth's cam of printing-machinery, Napier's cam, the expansion and exhaust tappets of steam-engines, and the cam of Breguet's telegraph manipulator, may be mentioned. Escapements (which see) convert the circular motion of a wheel into the reciprocating motion of a pendulum. Many other contrivances for converting circular into straight-line motion are in use, the screw (which see), the rack and pinion, and others; they are of great importance in self-reversing machines, and indeed in machines generally. *Link motion* is the name given to mechanism consisting of two cranks and a connecting-rod or link. The cranks may have reciprocating motions of a very varied character. The straight-line motion of the piston of a steam-engine is usually transformed

into the reciprocating motion in a circular arc of the end of a vibrating beam, by means of a piston-rod and *parallel-motion*, the object of the parallel-motion being to keep the end of the piston-rod in a certain straight line. Various forms of the parallel-motion are employed in steam-engines and machinery. *Ratchets* of different kinds, *the nipping-lever, the silent feed*, and other contrivances, are employed to convert reciprocal into discontinuous-circular motion. Very varied are the arrangements of mechanism employed to give peculiar motions; in general they are combinations of those mentioned above. The *fusee* of a watch, fig. 18, allows a more and more rapid turning motion of the box containing the main-spring, to enable the spring to give out as much work in a unit of time when nearly unwound as at any other time. Of special contrivances we may mention: conical pulleys and speed pulleys on shafts, the *link-motion* (which see) in steam-engines, various 'winding-on' and other arrangements in spinning-frames and mules, the *snail* of the striking part of clocks, the *knuckle-joint* of the power-loom and other machines, mechanism for counting the revolutions of wheels, wheels of elliptic and other shapes to give certain variable revolving motions to shafts, *Hooke's joint*, often employed on telescopes to transmit motion between two shafts hinged together, the various unique arrangements adopted in certain automata, and in the calculating machines of Babbage and others, and the *governor* employed in steam-engines and with water-wheels to cause the engine or wheel to give out more or less work when more or less work has to be performed, thus preventing much change in the velocity of the crank-shaft. Readers are referred to some separate articles, and also to Goodeve's Mechanism and Perry's Steam for more detailed accounts of mechanical arrangements.

The principle of conservation of energy (which see) is that energy is indestructible, and cannot be created. Part of the energy given to a machine is converted into heat through friction at rubbing surfaces, so that only part of it is given out by the machine as mechanical work. If we consider the moving parts at which mechanical work enters and leaves a machine, we find that the force exerted on the first part, multiplied by its velocity in the direction of the force (the work given to the machine in a second), is equal to the force exerted by the other part multiplied by its velocity in the direction of the force (the work given out by the machine), on the supposition that there is no friction or other source of loss of energy in the machine; but as there is always friction the latter product is really always less than the former. We see that those parts of a machine which move most slowly are capable of exerting the greatest forces, and it is for this reason that in any vibrating arm the parts moving most slowly are made very strong. A machine is most readily stopped or set in motion by small forces when these are applied to the parts which are capable of moving most rapidly. To determine by experiment the amount of work done against friction in a machine it is only necessary to measure the amount of work given out by it, and subtract this from the amount of work given to it, a process which is often performed by engineers. It is found that the work done against friction is proportional to the work given to any machine unless the velocity is very great; or, as it is sometimes stated, the friction is proportional to the load. To determine the amount and law of friction in pulley-blocks cranes, &c., the applied forces are found by trial which will not only balance certain weights but also cause a slow motion of the machine; a number of values may thus be found of the mechanical advantage. If these values are nearly the same it is easy to show by algebra that the law, friction proportional to load, has been proved. The difference between the *true* mechanical advantage and the mechanical advantage calculated on the supposition of no friction, is a fraction expressing the amount of the total energy which is wasted.

MECHLIN (French, *Malines;* Flemish, *Mechelen*), a town of Belgium, in the province and 14 miles S.S.E. Antwerp, with which, and with Brussels, Ostend, Liége, &c., it is connected by railway. It lies in a fertile plain, on both sides of the Dyle; is of a circular form, and entered by eight gates. It presents somewhat of a decayed and deserted look, and is remarkable for the quaint architecture of its houses, and the extreme cleanness of its streets. Its principal edifices are its cathedral, an ancient Gothic structure, with a massive square tower, 348 feet high; the church of Notre Dame, built on the model of the cathedral; the church of St. Peter and St. Paul, with a communion table regarded as a master-piece of wood-carving; and the archbishop's palace. The manufactures consist chiefly of fine lace, for which the town has long been famous; felt and straw hats, woollen stuffs, woollen covers, &c. The trade, in addition to articles of manufacture, includes corn, hemp, flax, and hops, facilitated greatly by Mechlin being the central station from which all the Belgian railways diverge. Mechlin is the see of an archbishop, and possesses a court of first resort, a communal college, an academy of design, a botanical garden, a society for the encouragement of the fine arts, several hospitals, and other benevolent institutions. It appears to have been founded in the fifth century. For some time it was the capital of a lordship, and was governed by its own counts. About 882 it was burned down by the Normans; but was rebuilt in 897, and soon after rose into importance. Its greatest prosperity was in the fourteenth century, when it had important manufactures of broad-cloth, which employed above 3000 looms. Pop. 42,381.

MECKLENBURG-SCHWERIN, a grand-duchy in Europe, a state of the German Empire; bounded on the north by the Baltic Sea; west by the principality of Ratzeburg, belonging to Mecklenburg-Strelitz, and by Lauenburg; south-west by Hanover; south by Prussia; and east by Prussia and Mecklenburg-Strelitz; area, 4847 square miles; capital, Schwerin (pop. 30,146). The surface is generally flat, the only exception being a ridge of low hills, which forms the watershed between the basins of the Elbe and the Baltic; the former receiving the drainage of the south and west, chiefly by the Elbe and its tributaries; and the latter that of the north, by the Trave, Stepenitz, Warnow, Recknitz, and Peene. The sea-coast is low, and much indented by several bays, of which the largest is that of Wismar. Lakes are very numerous, and, indeed, form one of the characteristic features of the country. The climate is mild, and the soil is generally fertile, and produces corn in such abundance as to leave a large surplus for export. After corn the principal crops are peas, beans, potatoes, and turnips. The rearing of stock attracts considerable attention, and the breeds have in recent times been much improved. Both horses and cattle are largely exported; and wool has become one of the most important sources of revenue. Woods, once extensive, have been very much mismanaged, and a serious want of timber begins to be felt. Minerals are of no consequence, and manufactures have not made much progress. The trade, consisting almost entirely to agricultural produce, and greatly facilitated by the proximity both of the Elbe and the Baltic, is extensive. The distillation of spirits from grain is carried on to a very great extent, and the taste for ardent spirits, particularly among the peasantry, is far too prevalent. The

government, which is a limited monarchy, is intimately connected with that of Mecklenburg-Strelitz. Each duchy has a separate legislative body, but both annually meet together, and have power to make common laws, and impose common taxes for the whole of Mecklenburg. Pop. in 1880, 577,055.

MECKLENBURG-STRELITZ, a grand-duchy of Europe, intimately connected with the above, and a state of the German Empire; capital, Neu-Strelitz (pop. 9407). It consists of two larger and several smaller districts; the former separated by the interposition of Mecklenburg-Schwerin, and the latter existing in separate patches. The two larger districts are the circle or lordship of Stargard, on the east of Mecklenburg-Schwerin, and inclosed on every other side by Prussia; and the principality of Ratzeburg, at the opposite extremity of Mecklenburg-Schwerin, and bounded on the north by the Baltic, and on the west by the territory of Lübeck and Duchy of Lauenburg. The whole area is estimated at 1052 square miles. The physical features of this duchy are the very same as those of Mecklenburg-Schwerin above described, to which, accordingly, reference is made. The duchies took no part in the Austro-Prussian war of 1866, but were active in that against France in 1870–71. Pop. in 1880, 100,269.

MECONIC ACID, $C_7H_4O_7$. When opium is exhausted with water, the extract neutralized with marble, evaporated to a syrup, and mixed with a concentrated solution of calcium chloride, calcium meconate separates out, from which, by suitable means, meconic acid may be obtained.

Meconic acid crystallizes in scales or small rhombic prisms which contain three atoms of water; it has a sour taste, reddens litmus strongly, and dissolves easily in water and in alcohol. Meconic acid forms three series of salts, represented by the general formulæ $C_7H_3MO_7$, $C_7H_2M_2O_7$, and $C_7HM_3O_7$, in all of which M = a monatomic metal. An aqueous solution of this acid is coloured deep red on the addition of ferric chloride, owing to the formation of ferric meconate; this colour is not destroyed by heat nor by dilute acids. By taking advantage of this reaction the presence of meconic acid in laudanum, &c., may be detected.

MEDALLIONS. The term *medallion* in numismatics is applied to those productions of the mint of ancient Rome, or struck in the provinces under the empire, which, if gold, exceed the *aureus* in size; if silver, the *denarius;* and if copper, the first or large brass. Antiquaries have long differed as to the purposes for which they were designed; they are generally, however, supposed to have been struck like the medals of our time, to commemorate some remarkable person or event. Yet circumstances are not wanting to render it probable that they were intended for circulation as money. Perhaps both objects were united, at least in many instances, a large number of pieces, of a definite value, being coined in memory of a great event, and thus adapted at the same time for current use. Medallions are not numerous. Those struck in the Greek provinces of the Roman Empire are more common than the Roman, but of inferior workmanship. A beautiful and famous gold medallion exists of Augustus, and one of Domitian, but few, in any metal, are found prior to the reigns of Hadrian and Antonine; those in brass are the largest, many of them being several inches in diameter, and for the most part of admirable workmanship. See NUMISMATICS.

MEDALS. See NUMISMATICS.

MEDEA (Greek, *Mēdeia*), daughter of Æetes, king of Colchis. By some her mother is said to have been Idyia, daughter of Oceanus; by others Hecate. Mythology ascribes to her a profound knowledge of the secret virtues of vegetables, by means of which she practised witchcraft. Her connection with Jason, the leader of the Argonauts, has already been noticed in the article JASON. For ten years she lived with him in wedlock, after having supported him in every danger, till the charms of Glaucē, or Creusa, the daughter of King Creon, kindled a new passion in him, and he discarded the unhappy Medea. According to some, Jason separated from her because of the reproaches heaped on him for having a foreign sorceress for his wife. Under the semblance of patient resignation she brooded on revenge. With this purpose she sent the bride, as a wedding gift, a garment which, when she put it on, enveloped her in a consuming flame, so that she died a death of the utmost anguish. Another account is that she sent her rival a poisoned crown of gold by her stepsons. She reduced Creon's palace to ashes by a shower of fire, murdered her two children by Jason, and then mounted her dragon chariot and escaped. Some say that she went to Hercules, others to Athens, to King Ægeus, by whom she had Medus. From Athens also she was banished as a sorceress. She finally returned to her home, where her son Medus reinstated her father, who had been dethroned by his brother Perses, after which she died. The story of Medea has often been a subject of poetry, especially of tragic poetry. The tragedies of this name, by Æschylus and Ovid, have perished, as well as the Colchides of Sophocles. The Medeas of Euripides and Seneca are alone extant. The story has also been made the subject of a tragedy by Grillparzer.

MEDELLIN, a city, Colombia, in the department of Cundinamarca, in the province and 30 miles south-east of Antioquia. It is a fine town, with an active trade, and has a very agreeable climate. Pop. estimated at 14,000.

MEDIA, an ancient country of considerable extent in Western Asia, formerly the seat of a powerful but short-lived kingdom, at present forming the north-west portion of Persia, particularly the provinces of Azerbijan and Irak Ajemi, with parts of Kurdistan and Laristan. Its exact boundaries are not known, but it lay generally between the Caspian Sea on the north and the mountains of Persia on the south, the great rivers of Mesopotamia on the west and the desert of Iran on the east. It was originally inhabited by a Turanian race, who are called Medes by ancient writers, but this name properly belongs to an Aryan race, who had spread themselves widely in the high regions of Western Asia, and ultimately established their ascendency in Media. The name is identical with the Madai of the Bible, which first appears (Gen. x. 2) as the name of the third son of Japhet. In religion, dress, and manners, the Medes closely resembled the Persians. In their mode of warfare the Medes bore some resemblance to their Turanian neighbours, being chiefly distinguished as horsemen and bowmen. They have been traced both by Persian and Indian traditions to the countries beyond the Indus. Up till the time of the establishment of the Median Kingdom it does not appear certain that the Aryans had acquired the predominance in Media. The country, which appears to have been governed by separate chiefs without a common head, was repeatedly conquered by the Assyrians, as under Ninus, according to the Assyrian traditions known to the Greeks, and later under Sargon, who settled Israelitish captives in it. According to the Greek historians the Medes, after asserting their independence of Assyria, set up a native king Deioces at an unknown date (according to Herodotus B.C. 708). The details at least of the story of Deioces, who reigned fifty-three years, appear to be of Greek origin. Phraortes, the successor

of Deioces, who reigned twenty-two years, and is credited with the conquest of Persia, fell in battle against the Assyrians. The historical evidence for both of these reigns is held by some authorities to be extremely doubtful. Cyaxares, the supposed successor of Phraortes, was the true founder of the greatness of the Median monarchy. In the early part of his reign Western Asia was overrun by Scythian hordes. After a severe conflict he obtained the victory, and established the Aryan ascendency in Media. This conflict appears by some accounts to have been the meeting of opposing streams of migrations, the Aryans coming from the east, the Scythians from the north, and the latter by their defeat being thrown to the south-west. Cyaxares extended his dominion over the highlands of Southern Armenia and Asia Minor as far as the Halys, but his greatest achievement was probably the overthrow of the Assyrian monarchy and the destruction of Nineveh, which he accomplished in conjunction with Nabopolassar, king of Babylon. The capture of Nineveh took place B.C. 625. After this the Median and Babylonian Kingdoms rose into power, and appear for a considerable time to have maintained a good understanding with each other, on the principle of the mutual respect which the greater predatory powers entertain for each other. Another important event in the reign of Cyaxares was a six years' war with Lydia, the only remaining great power in Asia, which seems to have been conducted without decisive advantage on either side, and was concluded through the mediation of Labynetus a Babylonian prince, and Syennesis a prince of Cilicia, by a marriage between Aryenis, daughter of Alyattes, king of Lydia, and Astyages, son of Cyaxares. The date of this war is uncertain; that of the last battle is only determined by an eclipse, about the time of which astronomers are not agreed, fixing dates as various as from B.C. 625 to 585. The most probable date appears to be B.C. 610. Labynetus appears to have been present at this battle as an ally of Cyaxares, and Cyaxares in turn appears to have assisted Nebuchadnezzar in his conquests in Palestine and Egypt. Astyages, the successor of Cyaxares, reigned for thirty-five years, B.C. 593 to 558, when he was overthrown or deposed by Cyrus. Little is known of his reign until the revolution with which it closed, which is one of the obscurest and most debatable incidents in history. Cyrus is said to have left him a satrapy, and he is supposed by some authorities to be the Darius the Mede mentioned in the book of Daniel as reigning over Babylon after its conquest by the Persians. The Medes and Persians, from their near resemblance and affinity to each other, appear to have amalgamated readily after the conquest or revolution which gave the ascendency to the latter. Media henceforward formed part of the Persian Empire, and shared its fate.

MEDIASTINUM, the name given to the spaces left in the antero-posterior plane of the chest, between the two layers of the pleura or lining membrane of the chest. The *anterior mediastinum* is bounded in front by the sternum or breast-bone, and inclines towards the left side. It contains the remains of the thymus gland; the origin of the sterno-hyoid, sterno-thyroid, and *triangularis sterni* muscles, the brachiocephalic vein of the left side, and some absorbent vessels. The *middle mediastinum* of some anatomists is the largest of these spaces, and contains the heart, with the great blood-vessels; part of the trachea at its division into the bronchi; and the phrenic nerves. The *posterior mediastinum* extends between the roots of the lungs and the sides of the dorsal vertebræ; its anterior boundary being the pericardium or sac in which the heart is contained. This latter mediastinum contains the aorta or great artery, springing from the left ventricle of the heart: the gullet: and pneumogastric nerves; the *vena azygos;* the thoracic duct; the splanchnic nerves, and some absorbent glands.

MEDIATIZATION. The process by which, on the dissolution of the German Empire in 1806, the smaller princes who had depended immediately on the empire were subjected to the authority of the princes of the Confederation of the Rhine, and became mediatized or dependent members of that confederation. See CONFEDERATION OF THE RHINE.

MEDICAL ACT, an act for the registration of medical practitioners. The Medical Act is the 21st and 22d Victoria, cap. xc., passed 2d August, 1858, amended by subsequent acts. The main provisions are in the principal act. The act establishes a general council of medical education and registration for the United Kingdom, together with branch councils for England, Scotland, and Ireland. The general council consists of one delegate from each of the following bodies:—The Royal College of Physicians, England; the Royal College of Surgeons, England; the Apothecaries' Society of London; the Universities of Oxford, Cambridge, Durham, and London; the College of Physicians of Edinburgh; the College of Surgeons of Edinburgh; the Faculty of Physicians and Surgeons, Glasgow; the Universities of Edinburgh and Aberdeen (one); the Universities of Glasgow and St. Andrews (one); the King's and Queen's College of Physicians, Ireland; the Royal College of Surgeons, Ireland; the Apothecaries' Hall, Ireland; the University of Dublin; the Queen's University for Ireland, together with six members chosen by the queen in council, four for England, one for Scotland, and one for Ireland. The branch councils consist of the members for each country respectively, together with the president chosen by the general council, who is a member of all. Members of the councils must be eligible for registration under the act. They are appointed for a term of five years, and are eligible for re-election. Registrars and other officials are to be appointed by the councils, the registrar for the general council to be registrar for England. Members of council are to be paid fees for attendance and travelling expenses. Branch councils are to defray their expenses from the fees received by them, and contribute to the expenses of the general council. Registrars are to keep correct registers, to alter addresses and erase the names of persons dying. Any person possessing the qualifications of fellow, licentiate, or extra-licentiate of any of the medical bodies named in the act, or Licentiate of Medicine or Master in Surgery of any university of the United Kingdom, or of Doctor of Medicine by doctorate granted prior to the passing of this act by the Archbishop of Canterbury, or by any foreign or colonial university to a person practising as a physician in the United Kingdom prior to 1st October, 1858, may be registered on producing certificate of his qualification. The fee for persons qualified before 1st January, 1859, to be £2, for persons qualified after that date £5. The general council may inquire into the course of study and examinations prescribed by the qualifying bodies, and if they deem them in any case insufficient may report to the privy-council, which shall have the right to suspend the right of registration for qualifications granted by such body. The power to grant qualifications may also be suspended in the case of any body requiring adherence to any particular theory in medicine or surgery as a condition of granting a certificate. Branch registrars are to report entries to the general registrar, who is to make them of the same date as in the local register. The registrar of the general council is to publish and sell annually The Medical Register,

containing the names of all persons appearing on the general register on 1st January in each year, alphabetically arranged, with dates of diplomas. Names may be erased from the register for crime, felony, or conduct professionally infamous. No person is to be erased who is expelled from any medical body for holding a particular theory in medicine. Additional qualifications may be registered on payment of additional fees. Registered persons are entitled to practise medicine and recover medical fees in all parts of the United Kingdom, but medical bodies may prohibit their members from suing for fees. No person can recover charges for medical attendance after 1st January, 1859, unless he is registered. Persons recognized in law as medical practitioners after the passing of the act must be registered practitioners. They are to be exempt from serving in juries, in the militia, and in corporate offices. No unregistered person is qualified to serve in the army or navy, or in connection with any hospital, asylum, public establishment, or friendly society.

MEDICI, one of the most distinguished families which rose to eminence through the independence of the Italian republics in the middle ages. The Medici, when they first appeared in history, were a Florentine family who had risen to wealth and influence by successful commerce, and they long continued to mingle the career of merchants and bankers with the exercise of political power and the holding, though sometimes without nominal office, of the chief authority in the state, and with a princely display of private munificence and a liberal patronage of literature and art. The great qualities by which they were enabled to carry on a career so complicated, and to gratify ambition under the semblance of moderation, and through the studied display of popular virtues, were chiefly exhibited by Cosmo (the elder) and his grandson Lorenzo, whose character in many points resembling, gave the tone to that of their family.

The first of the Medici who is known in history is AVERARDO, who was gonfalonier or head of the Florentine Republic in 1314. After this time they appear among the leading democratic families in Florence. They are said to have taken a leading part in the election of Gautier de Brienne, titular duke of Athens, to the sovereignty of Florence in 1342; and when among other acts of tyranny he put Giovanni de Medici to death for not defending Lucca with sufficient vigour against the Pisans, they joined the popular revolts which led to his overthrow in 1343. On the expulsion of the duke ALAMANNO DE' MEDICI headed an insurrection of the bourgeoisie (*popolo grasso*) against the nobles, who were expelled. This was followed by the triumph of the populace (*popolo minuto*), and the government became democratic. The nobles, who had joined the popular party, soon again showed oligarchic tendencies. The Albizzi acquired the supreme power, which they retained by a device recently invented—the making of lists of persons suspected of Ghibelinism, who were called *ammoniti* (admonished). The persons in these lists, in which they included their enemies, were excluded from public offices, and were liable to be brought to trial. BARTOLOMMEO DE' MEDICI, son of Alamanno, revolted against this tyranny about 1360. The conspiracy was discovered, and the accomplices of Bartolommeo, two ammoniti, were executed, but his pardon was procured by his brother Salvestro. SALVESTRO, who subsequently became the head of the party opposed to the Albizzi, was appointed gonfalonier in 1378, when, in alliance with the Ricci, he succeeded, after a struggle against the nobles and the populace combined, in securing the abolition of the ammoniti. In 1381 the Guelf party again triumphed, and Salvestro was banished. His son VERI enjoyed great consideration with the people, but while failing to head a popular insurrection against the Albizzi in 1393, he exposed himself to their vengeance by his sympathy with their enemies, and was banished, together with all the direct descendants of Salvestro. The family, excluded from politics by the decrees against the Ghibelines, now betook themselves to commerce; and while the Ricci and Albizzi were declining in wealth and influence, rapidly accumulated the means of future aggrandizement. GIOVANNI DE' MEDICI, son of Bicci, was not included in the banishment of his family, and continued his commerce in Florence, and amassed great riches. He was unambitious, affable, and liberal, but without seeking for honours he was three times prior of the *signoria;* in 1414 was chosen one of the ten members of the council of war, and in 1421 gonfalonier of justice. At his death, according to Machiavelli, he exhorted his two sons Cosmo and Lorenzo to follow his example, and to seek only those honours which were conferred by the good-will of their fellow-citizens, seeing that it was power acquired by violence, and not that voluntarily conferred, which caused hatred and division to arise. He died in 1429.

COSMO (the elder), his son, surnamed the *father of his country*, was the founder of the political greatness of his house, and was born in 1389. During the lifetime of his father he took charge of the great commercial concerns of his house, and also mingled in politics. He protected Pope John XXIII. (Balthasar Cossa) when he was compelled to flee from Rome, and was accused without foundation of having appropriated the wealth accumulated by him during his pontificate. Cosmo was elected prior of the signoria as early as 1416, and on the death of his father he became the leader of the popular party. He did not openly oppose the Albizzi, of whom his father had been a partisan; but while his prudence was equal to his father's, his character was firmer, and he gradually gathered the discontented around him, and excited the jealousy of the rulers by a popularity which he maintained by his studied politeness and consideration for the citizens of superior rank, and by a solicitous care for and boundless liberality to his inferiors. Despairing of maintaining their power against his growing popularity they at length caused him to be arrested (1433), and it was only by bribing their partisan the Gonfalonier Guadagni that he succeeded in getting the sentence of death which Rinaldo Albizzi had determined to procure against him changed to banishment for ten years. Cosmo retired first to Padua, and afterwards to Venice. A year later he was recalled, and Rinaldo banished. He now enjoyed undisputed authority in Florence, and he devoted his attention to maintaining the tranquillity which now reigned at home by securing peace abroad. He allied himself with Venice and with Francesco Sforza, duke of Milan; and by the skilful use of his pecuniary resources strove to make himself the mediator in the disputes of his neighbours, and to maintain the equilibrium of the powers of Italy. The government of Florence was still carried on according to the republican forms; but while the greatest deference was shown to the forms of liberty, the Medici or their partisans were always elected to the responsible posts. The wealth of Cosmo was greater than that of any private man in Europe, and it was liberally employed in the patronage of men of learning, philosophers, artists, and lovers of science. He was one of the chief promoters and supporters of the Renaissance. He established an academy at Florence for the study of the Platonic philosophy. He accumulated through his correspondents manuscripts in Greek, Latin,

and oriental languages, which formed the basis of the Laurentian Library. He spent large sums in adorning Florence with magnificent buildings, both civil and religious. He even built an hospital at Jerusalem for the accommodation of pilgrims. In his control of the government he exhibited much skill as well as moderation, always preferring to keep in the back-ground; and while his popularity left him little to fear from his enemies, he had the art to use them as a means of enforcing moderate counsels with his friends. He died at Florence 1st Aug. 1464, leaving his place to be filled by his son Piero. His son Giovanni had predeceased him.

PIERO, born in 1414, was, it is said, assisted from an early period of his administration by his son Lorenzo, but his ill health compelled him to leave the management of affairs in great measure to his partisans. Diotisalvi Neroni, with the view, it is alleged, of undermining the popularity of the Medici, recommended to him a stricter administration of the affairs of his banking-house. The liberality of Cosmo had made nearly all Florence his debtors, and the attempt to enforce these claims, which Piero had soon to abandon, made numerous enemies. Luca Pitti, Nicolo Soderini, Agnuolo Acciajuoli, and other of the more considerable men of the Medici party, now began to plot their overthrow. Their ostensible object, in which many of them were not sincere, was to restore the ancient government of Florence. Failing to accomplish their object by moderate means, they determined on the assassination of Piero in his own house at Careggi. The plot was discovered, and Piero came to Florence with a numerous body of armed men. The conspirators voluntarily exiled themselves, and the chief power was again conferred on the Medici 1st September, 1466. The exiles, with the assistance of Venice, raised an army. An indecisive battle was fought near La Molinella July 25, 1467, but peace was made in the following year without any stipulation in their favour. The government was now carried on arbitrarily. The families of those who had promoted the war, and the personal enemies of the Medici and their partisans, were exposed to relentless persecutions. Public executions alternated with the balls and fêtes given by the young Medici. It is said that Piero, unable to control the arbitrary conduct of his partisans, contemplated the recall of the exiles, when he was anticipated by death, 1469.

His sons LORENZO and JULIANO were proclaimed Princes of Florence, and for some years the government was carried on peaceably by them and their partisans. Lorenzo, surnamed the *Magnificent*, the elder by five years, born 1st January, 1448, had been brought up by his father and grandfather in all the learning so highly prized in that epoch. He had been surrounded by the most distinguished masters, both literary and philosophical, of his age. Among his fellow-students were Poliziano and Pico de la Mirandola. Greek and Latin literature and the Platonic philosophy were the staples of the intellectual aliment supplied to him; but he did not neglect his own language, and cultivated Italian poetry with a grace of diction uncommon in his day. He visited the courts of the Pope Paul II. and Ferdinand of Naples, as well as the states of Venice, Milan, Ferrara, and Bologna. He had married in 1469 Clarissa, the daughter of Jacopo Orsini, one of the great nobles of Rome. The first years of his government were distinguished by an attempt of the exiles, and one or two other incidents, which only served to confirm his power. The corruption of manners consequent on the loss of liberty had begun to gain in Florence, and the subserviency of the people had become general. The external influence of the republic had declined, but the system of balance of power devised by Cosmo, by which its tranquillity was preserved, remained. A mutual defensive league was formed in 1474 between Florence, Venice, and Milan. The pope, Sixtus IV. and the King of Naples, who had already combined against the Medici, declined to join it. Jealousy of the power of the Medici, however, still existed in Florence. In the midst of profound peace the Pazzi, next to them the richest and most powerful family in Florence, and who had some private grudge against Lorenzo, began to intrigue with the pope and the King of Naples for their overthrow. Despairing even with external assistance of open force, they determined to employ assassination. The plot, which was arranged with the assistance of Salviati, archbishop of Pisa, a creature of the pope, after many delays was put in execution 26th April, 1478, in the church of San Reparata. Juliano was killed, but Lorenzo contrived to resist his assassin and escape. His friends in the meantime took to arms, the insurrection was suppressed, three Pazzi and the archbishop were hanged, and about seventy citizens of Florence were put to death for complicity in the conspiracy. The pope and the King of Naples now took up arms, while the former thundered anathemas against him for the murder of the archbishop. Venice declined to assist the Florentines, and Lorenzo, reduced to extremity by a victory of Alfonso of Calabria, set out for Naples, where he succeeded in gaining Ferdinand to his alliance, and separating him from the pope. The pope and the Venetians, who were now his allies, would have pressed the war, but an opportune attack of the Turks on Otranto (1480) diverted their attention and saved Florence. The rest of Lorenzo's reign was passed in peace and in those acts of profuse liberality and magnificent patronage of arts and sciences, in which he rivalled or excelled his grandfather. His profusion, however, was attended with even less prudence and calculation. He dissipated not only his own resources, but those of the republic, so that at length it became necessary that either he himself or the state should become bankrupt. His advisers chose the latter, and the interest of the public debt was arbitrarily reduced from 3 to 1½ per cent. (1490). At the same time the losses incurred in business through the want of personal superintendence and the infidelity of agents induced him to abandon commerce. The title of *Magnificent*, which has been conferred on him by posterity, seems to have arisen from a misconception. It was given him by his contemporaries as the common title of the day in Italy for designating sovereign princes who had no particular title. He increased the Laurentian or Mediccan Library, so rich in manuscripts, founded by Cosmo in 1471. He also opened a school of the arts of design in a palace adorned with ancient statues and excellent paintings. All who in this age had gained a reputation in Florence for great talents shared his patronage. He died in 1492. The Opere di Lorenzo de' Medici, detto il Magnifico, were published at Florence in 1826 in a splendid edition, at the expense of the Grand-duke Leopold II., and contain the first complete collection of his poems (four vols. quarto).

Lorenzo left three sons—PIERO (born Feb. 15, 1471), who married Alfonsina Orsini; GIOVANNI, at the age of fourteen cardinal, and afterwards Pope Leo X.; and GIULIANO, duke of Nemours. Piero, the new head of the state, came to power at a difficult crisis. He was vain, and destitute of statesmanlike qualities, and soon alienated the Florentines. When Charles VIII. invaded Italy he hastened to submit, gave up Sarzana and other towns to him, and engaged the republic for a loan of 200,000 florins. The indignant

Florentines drove him from the city, 9th November, 1494. He spent the remaining years of his life in raising up enemies to them and endeavouring to secure his return. He was drowned in the passage of the Garigliano, 27th December, 1503. Giuliano II., brother of Piero II., had actively assisted his brothers Piero and Cardinal Giovanni in their efforts for the restoration of his family. In 1512 the Holy League, headed by Pope Julius II., which had expelled the French from Italy, tempted by the pecuniary promises of the Medici, ordered the Spanish troops accompanied by Cardinal Medici to march upon Florence. In consequence of this a revolution occurred in Florence, and the Medici were restored, at first as simple citizens; but they soon seized the reins of government, and Giuliano became head of the state. Too easy and liberal to restrain the turbulent Florentines, he resigned the government in 1513 to his nephew Lorenzo, and retired to Rome, where he received from his brother, now become Leo X., the appointment of captain-general of the church. Lorenzo II., born 13th September, 1492, spent his youth in exile. He was educated as a hereditary prince, and succeeded his uncle Giuliano near the close of 1513. He was hated for his arbitrary views and his haughty demeanour, but he seconded better than his uncle the ambitious views of Leo X., who in 1515 gave him the command of the troops of the church, and employed him in the conquest of Modena. In 1516 he invested him with the Grand-duchy of Urbino. In 1518 Lorenzo married Madeleine de la Tour, daughter of Jean III., count of Auvergne and Boulogne. He died in 1519 of a malady contracted in Paris, it is said, through his licentious behaviour on the eve of his marriage. His wife died a few days before him in giving birth to a daughter. (See CATHARINE DE' MEDICI.) The pope was now the only legitimate male descendant of Cosmo. Lorenzo, the brother of Cosmo, had still legitimate descendants, but the two families were at enmity. The government of Florence was for a time conducted by Cardinal Giulio, afterwards Clement VII., the illegitimate son of Giuliano, brother of Lorenzo the Magnificent. There were two other illegitimate descendants from the line of Cosmo—Cardinal Ippolito, son of Giuliano II., and Alessandro (born about 1512), an illegitimate son of Lorenzo II. or of Cardinal Giulio. When Cardinal Giulio became pope in 1523 he appointed Silvio Passerini, cardinal of Cortona, regent for these two children. When Rome was taken by Bourbon in 1527, Passerini, struck, with the other adherents of the house of Medici, with panic, abandoned Florence, and the city was for a brief period left to its liberty. At the instance of Clement VII. Alessandri was restored by the troops of Charles V. after Florence had undergone a siege lasting from October, 1529, to August, 1530, in which Philibert, prince of Orange, the commander of the imperial army, was killed. Alessandro had been created by the pope in 1521 Duke of the Città di Penna. By an imperial decree of 28th October, 1530, officially published in Florence 6th July, 1531, he was declared hereditary head of the republic, which was to enjoy the same liberties as it had enjoyed under the Medici since 1434. In 1532 he was named Doge or Duke of Florence; the ancient forms of the republic were abolished, and two councils, composed entirely of his creatures, were appointed to aid him in the government. He disarmed the people, built a fort to command the town, multiplied sentences of exile and confiscation, and exercised his tyranny without restraint. In 1535 he caused Cardinal Ippolito, who had intrigued against him at Rome and with the emperor, to be poisoned. He married in 1536 Margaret, the illegitimate daughter of Charles V. He was assassinated 6th January, 1537, by Lorenzino de' Medici, a descendant of Lorenzo, the brother of Cosmo. On the death of Alessandro Cosmo a descendant of the same Lorenzo was chosen head of the republic, with the same title, but with limited powers, 9th January, 1537. His election was confirmed by the emperor, who garrisoned the fortresses of Florence, Pisa, and Leghorn. The Strozzi, who are accused of having instigated the assassination of Alessandro, made an effort to restore the republican government by an invasion, in which they counted on the support of France and the pope. They were defeated by the Spanish troops, and the captives were tortured and put to death by Cosmo. The government thus commenced was carried on with like tyranny. Cosmo continued in close alliance with the emperor, and repulsed the advances of France, while he attempted to procure the assassination of Piero Strozzi, who had become a marshal of France. He carried on commerce, which his branch of the family had not abandoned, and his example in this respect was followed by several of his successors. He had banking establishments at Angiers, Lyons, London, and Augsburg, and in his own states he commanded a monopoly of certain articles of commerce. With the proceeds of these undertakings he built fortresses and palaces. He finished the Pitti Palace, which he bought for his wife. In 1555 he conquered Siena; in 1564 he resigned the administration of affairs to his son Francisco; in 1569 the pope conferred on him the title of Grand-duke of Tuscany. When not influenced by political considerations he administered justice impartially. He also patronized art and letters, but in persecuting the reformers no prince showed greater deference to the pope. He died in 1574. FRANCISCO MARIA, his son, obtained from the Emperor Maximilian II., whose daughter Joanna he had married, the confirmation of his title in 1575, which continued in his family until it became extinct in 1737 on the death of Giovanni Gasto, who was succeeded by Francis, duke of Lorraine. See TUSCANY.

MEDICINE, the science of diseases, and the art of healing or alleviating them. It is founded on the study of man's physical and moral nature, in health and in disease. Created by necessity, the offspring of instinct, observation, time, and reflection, it began in ages previous to the records of history; it has struggled at all times, and continues to struggle, with favourite theories; has been influenced by all systems of philosophy and religion, by truth and superstition; and has, with the slowness which marks all the important advancements of mankind, but lately emerged from some of the prejudices of thousands of years, and will long continue subject to others. Like other sciences, medicine has gained more from the single discoveries of close observers than from centuries of theory. For the few hundreds of years in which men have begun to apply themselves more to actual observation, and the human body has been carefully studied, medicine, like all the natural sciences to which it is so near akin, has made great progress. The higher kinds of skill and knowledge, in the earlier stages of nations, are in general exclusively appropriated by the priests, and this has been the case with medicine and the other branches of natural science. In the sacred writings mention is occasionally made of the external application of oil and wine, and of the effects of warm bathing in the treatment of the sick. Amongst the Assyrians it was usual to carry those afflicted with diseases to the gates of the temples, where they might have an opportunity of imploring the advice and assistance of those who passed by. Machaon and Podalirius are mentioned in the Iliad

of Homer as having been 'good physicians,' and their skill in the cure of wounds is recorded with great praise. They are called the sons of Asclepios or Æsculapius, the god of medicine. Hippocrates is the earliest author on medicine whose writings have been preserved. He lived about the middle of the fifth century B.C., and was a man of very superior talents and great medical acquirements. His writings maintained an unrivalled authority over the minds of his successors for many centuries, and by the consent of posterity he has been styled the Father of Medicine. The remedies which he employed were principally evacuants, more especially purgatives, and he also prescribed diuretics and sudorifics. He was accustomed to draw blood both by the lancet and scarifications, employed cupping-glasses, inserted issues, and used injections. Most of the active drugs of the present day were unknown to him; all the powerful metallic preparations, for instance, as well as the spirituous and ethereal compositions; and anodyne and narcotic remedies were but little valued.

The doctrine of Hippocrates may be called the *empiric rationalism;* and, numerous as are the systems that have flourished since, in ancient and modern times, mankind have always returned to his principle of making observation the only rule in the treatment of diseases. The doctrine of Hippocrates was blended, by his immediate successors, with the Platonic philosophy, whereby was formed the (so called) *ancient dogmatic system.* In Alexandria, which was from 300 B.C. the seat of learning, medicine was one of the branches studied, but soon degenerated into mere dialectics and book-learning. Hence we find it soon followed by the empiric school (286 B.C.), the methodic school (100 B.C.), the pneumatic school (68 B.C.), and at length by the eclectic school (81 A.D.), which took from all the others. A philosophical and great mind was required to put an end to so confused a state of medical science, and such a mind appeared in Galen (see GALEN), of Pergamus. His system acquired an almost undisputed pre-eminence during the middle ages, and down to the sixteenth century. For some time (in the seventh century) the intellectual Arabians cultivated the sciences, and with them medicine. They also founded their medicine on that of Galen, but fashioned the science according to their notions, and left it not unimproved in respect of practical application and pharmacology. Arabian medicine reached its highest point under Avicenna (born 980), who for some time was esteemed even higher than Galen; the opinion of the latter's superiority, however, eventually revived. The Western medicine begins with the medical school of Salerno, perhaps existing as early as in the ninth century, but well established by the middle of the twelfth century, where medicine was taught according to the principles of the Greeks. During the rest of the middle ages there existed a Galeno-Arabian science of medicine, mostly fostered by ignorant monks, and only gradually struggling on, after suffering, perhaps, more than any other science, from every superstition and every misconception of nature. In the fourteenth century anatomy was improved by Mondini; later, the knowledge of medicaments, by the discovery of new and distant countries; practical medicine by the appearance of new diseases, and not a little by the frightful syphilis. The love of Greek literature was revived by the scholars driven from Greece by the conquest of Constantinople (in 1453), and men having begun to read the Greek medical writers, especially Hippocrates, in the original language, a more scientific and liberal spirit of investigation took the place of slavish adherence to antiquated prejudice. Thus the fall of the Galenic system was prepared, which was completed in the sixteenth century, and forms the essential part of the reformation produced by Theophrastus Paracelsus (1526). The chemico-theosophical system of this enthusiast was refined and arranged by J. B. van Helmont (who died in 1644), until, deprived of its theosophical character, it passed over into the chemico-material system of Francis Sylvius (who died in 1672), and at length into the psychiatric system of Stahl (who died in 1734). Yet, soon after Harvey's great discovery of the circulation of the blood (in 1619), the iatro-mathematical doctrine, under Alphonso Borrelli (who died in 1679), developed itself, which finally took the shape of the dynamic system of Fr. Hoffmann (died 1742), from which the dynamic schools of modern times proceeded. Hoffmann, who may be called the morning star of the reformation of medicine, feeling the insufficiency of all the opinions of his predecessors, and clearly perceiving that the animal body was influenced by laws quite different from those presiding over inanimate matter, dedicated himself to a careful examination of the nature of the operations of the respective parts of the body, whereby he perceived that certain organs possessed specific actions, and that those of the brain and nerves were of all others the most remarkable, and unlike what was to be observed in the other objects of nature. To the nervous system, therefore, he referred the effects of vitality, and to the nervous influence he attributed the production of two diseased states of the system, dissimilar and opposite to each other, to which he applied the terms of *spasm* and *atony*—the first expressing the condition of increased, the second of diminished activity.

Upon this doctrine Dr. Cullen of Edinburgh laid the foundations of his system. Discarding in the most positive manner the merely mechanical powers of matter as accounting for the phenomena of vitality, and resting all his opinions upon the specific properties of the living body, he taught that the great agents in all the operations either of health or disease are the minute fibres of the nerves and muscles, which he says are the immediate cause, not only of sensation and motion, but of all the changes gradually effected in the internal economy of the system; that the most important of these changes are produced through the medium of the minute terminations of the arteries, and that the action of these vessels is perfectly competent to produce all the changes that occur, both in the state of the fluids and solids. He adopted the spasm and atony of Hoffmann, but refined so far upon their nature as to conceive it possible for the two conditions to exist at the same time in different parts of the system.

Soon after the promulgation of this system Dr. John Brown, also of Edinburgh, proposed another equally novel and striking. He taught that every living being possesses a specific power or excitability, from which all its appropriate functions arise; that every circumstance, either external or internal, which can affect a living animal, is an excitement or stimulus, and contributes to expend a portion of its excitability; that upon the proper action of these excitements depends the due development of the vital powers; so that, whenever they are applied in an immoderate degree, the excitability is too speedily expended, the animal becomes exhausted, and falls into a state of *indirect debility.* But that if, on the contrary, there should be a deficiency of stimulus, the powers of life become languid from a want of being called into play, and a contrary state, or *direct debility,* ensues, and the excitability becomes preternaturally accumulated. Thus, when the body suffers from the want of food, it falls into a state of direct debility; whereas, if the system has been inordinately excited by a large quantity of wine, and a state of languor follows from it, the condition so induced is

that of indirect debility—the first being from defect, and the latter from excess of excitement; that the state of the body, as to sensibility, is ever the same in kind, and can only vary in degree, being always invariable in the same individual, except what may depend upon the smaller or greater quantity of excitability called into action at different periods; moreover, that the portion of excitability possessed by each individual was allotted to him at birth, and that this original stock cannot by any means be increased; but that it cannot be expended at more than a given rate without producing a diseased condition of the body, and that if, from any cause, this rate be exceeded, a certain portion of time is requisite to restore the balance between the supply and deficiency; that the excitability resides both in the muscles and nerves: that its quantity in the different parts of the body exists always in the same proportion as relates to each other, whereby whenever it becomes excessive or defective in any one organ, it likewise does so in every other part, owing to the balance naturally existing between them. Hence he concluded that all diseases may be divided into two great classes, either of excess or defect—or as he calls them, *sthenic* or *asthenic*—of which the principal differences in each class consist in the parts which they affect, modified by peculiarities in the temperament, sex, age, habits of life, &c. &c.

The system of the celebrated Darwin is similar in many respects to that of Brown. He commences by assuming the existence of a certain power or faculty attached to the living body, which is the immediate cause of all the phenomena of life, to which he gives the name of *spirit of animation* or *sensorial power*. This resides both in the muscles and nerves, and is equally the origin of motion and sensation. It is called forth by the action of various stimulating powers, and is capable of accumulation and exhaustion, upon which states of excess or defect all the diseased trains of action depend. That there are two kinds of debility, either from defect or from excess of excitement. But he differs from Brown in not limiting the portion of excitability, for he conceives that the sensorial power may be generated from time to time by the nervous system, exactly as it is required for the purposes of life, by a process resembling secretion. Darwin divides diseases into four great classes depending upon certain functions of the sensorial power, which are, irritation, sensation, volition, and association.

One of the latest trains of medical reasoning, or systems of medicine, which has been proposed is that called the doctrine of plethora. In this all the derangements of the animal economy are attributed to general or partial fulness of the blood-vessels, or *plethora*. The work in which this doctrine is presented in the most methodical and connected form was written by Dr. Parry of Bath, and entitled Elements of Pathology; and the points he attempts to illustrate and establish are these:—That the system of the blood-vessels is that which is most frequently deranged, and from which nearly all diseases originate. That partly from the natural constitution of the body, partly from the present acquired habits of civilized society, these derangements generally proceed, in the first instance, from an excess in the quantity or the moving force of the blood, added to which, that our blood-vessels are peculiarly liable to a state of local plethora or fulness—a state of parts which may occur even when there is a general deficiency in the quantity of the fluids. That this plethora may have its origin from two distinct causes: either from the increased force of the heart, or from the resistance of the vessels; but that although the mechanical effect of these causes be nearly the same, and the mode of treatment be also in a great measure similar, yet that the state of the vital powers of the system, or at least of the part affected, are totally opposite to each other. Lastly, Dr. Parry endeavours to prove that the affections of the nervous system are entirely secondary and subservient, and that these likewise originate from an excessive determination of the blood to the substance of the nerves themselves, and that the distinction between diseases arises principally from the parts that are affected; and that the character of their symptoms is determined either by the particular structure of the organ, by the nature of the cause producing the disease, or by the peculiar habits or constitution of the individual.

Among the newest systems may be mentioned the homœopathic system of Hahnemann (see HOMŒOPATHY), the hydropathic system (see HYDROPATHY), and that of M. Broussais, a Frenchman who strove to trace all diseases to inflammation of the bowels. —See Kurt Sprengel's Geschichte der Arzneikunde (third edition, Halle, five volumes, 1827; translated into French, Paris, 1816); J. F. K. Hecker's Geschichte der Heilkunde (Berlin, 1822–29, two vols.); Hamilton's History of Medicine (London, 1831, two vols. 8vo; &c.)

The various medical sciences, or those closely connected with them, and more or less requisite for a thorough knowledge of medicine, may be thus enumerated:—The whole range of natural sciences, as zoology (including comparative anatomy and physiology), mineralogy, geology, botany, natural philosophy, chemistry, &c.: psychology, which teaches the various phenomena of soul and mind: anatomy, which teaches the form and situation of the organs by the examination of dead bodies, and is divided into osteology, treating of the bones; syndesmology, of the ligaments; myology, of the muscles; splanchnology, of the intestines; angeiology, of the vessels; neurology, of the nerves; and physiology, which treats of all the phenomena of life in connection. Such is the basis of all those branches of science which may be more particularly called *medical*, and which we will now enumerate. The science of health, that is, of that in which it consists, its conditions, and its signs, is called *hygiene*, or as far as it relates to the regulation of the diet, *dietetics*. *Pathology*, on the other hand, is the science of disease, of that in which it consists, its origin, &c. *Nosology* treats of the various sorts of diseases, their origin and symptoms, and strives to arrange diseases into one whole. *Pathological anatomy* teaches the mechanical alterations and changes of structure. *Therapeutics* is the science of the cure of diseases, often divided into *general*, treating of the subject of cure in general, its character, &c.; and *special*, of the cures of the particular diseases. *Surgery* treats of mechanical injuries, and the mode of relieving diseases and derangements by mechanical means. *Obstetrics* treats of the modes of facilitating delivery. *Materia medica* is the science of medicines, their external appearance, history, and effects on the human organization. *Pharmacy* teaches how to preserve drugs, &c., and to mix medicines. *Clinics* (see CLINICAL MEDICINE) applies the results of all these sciences to real cases. We should mention, in this connection, the history and literature of medicine; the history of diseases, a very interesting branch; forensic medicine, that branch which enables the physician to give to courts and other legal authorities proper explanations in regard to personal injuries, particular appearances of the body, &c., as whether a wound was mortal, how inflicted, whether a child was dead before being born, &c. In many countries physicians are appointed by the government for this purpose. We must last mention *midwifery*, as taught in many countries to women, who make a regular study

and business of it. A student of medicine ought to be well versed in the two learned languages, and cannot dispense with a respectable knowledge of English, French, German, and Italian. Among the works which treat of medicine at large are Dictionnaire des Sciences Médicales par une Société de Médecins et Chirurgiens (Paris, Panckoucke, containing sixty vols. 1812 to 1822), Encyklopädisches Wörterbuch der Medicinischen Wissenschaften (edited by the professors of the medical faculty at Berlin); also Good's Book of Medicine; Copland's Dictionary of Practical Medicine (three vols. London, 1858); Reynolds' Dictionary of Medicine; &c.

MEDICK (*Medicago*), in botany, a genus of leguminous plants largely used in agriculture. (See LUCERNE.) It differs from *Trifolium* (clover) chiefly in having a long, curved, or heliacal many-seeded pod and equal calyx teeth. The Tree Medick (*Medicago arborea*), supposed to be the cytisus of the ancients, flowers the greater part of the year (from April to December). It is an elegant shrub, with delicate stem and handsome leaves. It is abundant in South Italy, where it affords nourishment to the goats. In this country it will only grow in warm and sheltered situations. The Hop-trefoil (*Medicago lupulina*) is supposed by some to be the Irish shamrock. It nearly resembles common yellow clover, but is larger. It is also a perennial plant, while clover is an annual.

MEDINA (Arabic, *Medinah-el-Nebi*, The Prophet's City), a city in Arabia, celebrated for containing the tomb of Mohammed, about 248 miles north by west of Mecca. It is situated in the most fertile spot of all Hejaz, with an immense plain extending south from it; in every other direction the view is bounded by hills or mountains. The town forms an oval, surrounded by a strong stone wall, flanked with towers, while on a rock, at its north-west side, stands the castle. Of its four gates, that looking eastwards, and called the Bab-el-Misri, or Egyptian Gate, is remarkable for its beauty. Medina has no large buildings except the great mosque, two smaller ones, a college, and public baths. The houses are of stone, two stories high. Beyond the walls of the city, west and south, are suburbs consisting of low houses, yards, gardens, and plantations. These suburbs have also their walls and gates. The Mosque of the Prophet stands at the east side of the city, and resembles that at Mecca in its plan, though on a smaller scale. The tomb of the prophet is inclosed with a screen of iron filagree, painted green, and of excellent workmanship, at the south side of which the pilgrim goes through his devotions, for all of which he pays, but is consoled with the assurance that one prayer here is as good as a thousand elsewhere. Admission into the inclosed area, or El-Hejarah, is allowed only to pashas, leaders of the Haj, and such like, on payment of a large fee. Though the pilgrimage to the prophet's tomb is not considered by Mohammedans as an imperative duty, like that to the Kaaba, yet great numbers flock to the former, and the more ignorant classes of pilgrims, from Africa particularly, seem to prefer decidedly the Mosque of the Prophet to the house of God. It is estimated that one-third of the Mecca pilgrims go on to Medina, the pilgrimage to which may be performed at any time of the year. The inhabitants of Medina are mostly not of native origin, but strangers who have settled, becoming complete Arabs, however, in feelings, manners, and language. In Medina commerce is held in contempt, and the sentiments of the Bedowin, in this respect, here retain their unabated force. The business of the place is all done by the merchants of Yambo or Yembo, a port on the Red Sea, about 105 miles south-west. The population of Medina is supposed to be from 16,000 to 20,000, of whom 12,000 are within the walls. Since 1814 Medina has been the capital of the north pashalic of Arabia.

MEDINA-SIDONIA, a city of Spain, in Andalusia, in the province of Cadiz, 23 miles E.S.E. of the town of Cadiz, in the form of an amphitheatre, on a broad eminence, in the middle of an extensive plain. The inhabitants subsist by agriculture, cattle-rearing, manufactures of earthenware, bricks, frieze, millstones, esparto, cordage, &c.; flour and oil mills. Carrying grain and other produce to Cadiz, and other places, is an important occupation. Pop. 12,367.

MEDITATIO FUGÆ. In Scotch law a debtor *in meditatione fugæ*, that is, who contemplates flight, may be arrested by a summary process or a warrant from a sheriff, magistrate, or justice of the peace. If a creditor applies for such a warrant without sufficient grounds he is liable in damages, and a judge who grants it illegally may be subjected to the same penalty.

MEDITERRANEAN SEA (Latin, *Mare Internum*), a great inland sea, between lat. 30° 20' and 45° 50' N.; and lon. 5° W. and 35° E., about 2200 miles long; breadth, from Venice to the Bay of Sidra 1200 miles. It washes the shores of Europe on the north and north-west, those of Africa on the south, and those of Asia on the east, and communicates on the west with the Atlantic Ocean by the Strait of Gibraltar, and on the north-east with the Black Sea through the Sea of Marmara and the Straits of the Dardanelles and Constantinople. It is very irregular in shape, and by the projection of the south part of Italy, and of Cape Bon in Africa, and the interposition of the island of Sicily, is divided, near its centre, into two distinct and not very unequal portions, an east and a west. In addition to these, the other important subdivisions are the Tyrrhenian or Tuscan Sea, between the west coast of Italy and the islands of Sardinia and Corsica; the Adriatic Sea or Gulf of Venice, between the east coast of Italy and the west coast of Turkey in Europe and Dalmatia; the Ionian Sea, between the west coasts of Turkey in Europe and Greece, and the south part of Italy and the island of Sicily; the Ægean Sea or Archipelago, between Turkey in Europe and Greece on the west, and Turkey in Asia on the east; and the Levant, which is usually understood to include the whole sea east of the island of Crete. The largest gulfs are on the shores of Europe, those of Lion or Lyons, Genoa, Taranto, Lepanto, Koron, Kolokythia, and Salonica; on the shores of Asia, Adrymiti, Smyrna, Adalia, and Skanderoon; and on the shores of Africa, Sidra and Cabes. The largest and most important islands are Sicily, interposed, as already mentioned, between the two great divisions of the sea, Sardinia, Corsica, and the Balearic Isles, in the west division; and Cyprus, Rhodes, Crete, the Ionian Isles, and Malta, in the east division. The principal rivers which discharge themselves into the Mediterranean are the Ebro, Rhone, Po, and Nile; but its communication with the Black Sea entitles it to claim it as part of its basin, and, consequently, also the great rivers Don, Dnieper, Dniester, and Danube. Between Cape Bon and the Sicilian coast, where the water is shallowest, the depth barely exceeds 30 fathoms; but in almost all other places, particularly at a distance from the shores and islands, the depth is very much greater. Owing to the very narrow channel which connects the Mediterranean with the main ocean, there is very little tide; though in some places, as in the Ionian Sea, the Adriatic, on parts of the African coast, &c., a rise of more than 6 feet sometimes occurs. The prevailing winds are the south-east and south-west in spring, and the north-east and north-west during the rest of the year. They often

blow suddenly, and with great violence. The most remarkable are the Bora in the Adriatic; the Etesian and Tramontana in the Ægean; and the burning Sirocco, from the African desert. The Mediterranean abounds with fish, and also furnishes the finest coral, sponge, and ambergris.

MEDJIDIEH, a Turkish order instituted by the Sultan Abdul Medjid in 1852, destined to recompense services rendered to the government of the Porte. It was divided into five classes, composed of 50 members for the first class, 150 for the second, 800 for the third, 3000 for the fourth, and 6000 for the fifth. The ribbon of the Medjidieh is deep red, with a narrow border of green. The star of the order, a large silver medal with a circle enamelled in red, surrounded by silver rays separated by crescents and stars, is bound to the ribbon by a large crescent enamelled in red. The first class wear ornaments in brilliants. In the centre of the medal is the name of the sultan, with the motto for 'Zeal, Honour, Loyalty.' Several French and English officers received this decoration after the Crimean war. The order has ceased to be conferred since the death of its founder, the Sultan Abdul Aziz having replaced it by the order of Osmanieh.

MEDLAR (*Mespilus Germanica*), a small European tree, allied to and somewhat resembling the quince, and belonging to the natural family Rosaceæ. The flowers are moderately large, white, and solitary at the extremities of the branches; the calyx and peduncles are cottony; the fruit, in the cultivated varieties, is large, and before it is perfectly ripe has an excessively austere and astringent taste. The medlars do not ripen naturally on the tree, but are collected in the autumn and spread upon straw till they become soft, and approach the state of decomposition. They have now a sweet vinous flavour, which, however, is not to the taste of most people.

MEDOC, a district of France, in the ancient province of Gascony. It comprises nearly the whole of the arrondissement of Lesparre, and some communes in that of Bordeaux, in the department of the Gironde. It is mostly covered with vines, which are cultivated with great care, and the wines produced from which have a high reputation. See BORDELAIS WINES.

MEDULLA, or MARROW, in animals, the highly vascular connective tissue, interspersed with adipose or fat-cells, which fills up the hollow shafts or *medullary canals* of long bones, and which forms a centre of nourishment for the inner osseous material of which the bone is composed. The marrow is supplied with blood generally by a special artery—the *nutrient* artery of the bone—and from this source the marrow itself, and the delicate lining membrane of the medullary canal, derive their supply of nutrient matter. The bone-tissue itself is nourished by numerous minute blood-vessels which are distributed in the *periosteum* or fibrous membrane investing the bone externally. These blood-vessels enter the numerous minute nutrient canals which permeate the bone-tissue, and which are known as *Haversian canals;* and these latter channels in turn communicate with the marrow, their blood-vessels running into those which traverse the medullary substance. In this way the circulation of blood throughout a tissue apparently so dense as that of bone is seen to be well provided for.

MEDULLA, or PITH, in vegetable physiology. This substance consists essentially of cellular tissue, and forms a cylindrical or angular column at or near the centre of the stem of the plant. The pith is not usually continued into the root, but is always directly connected with the terminal bud of the stem, and in the first instance also, by means of the medullary rays, with the lateral leaf-buds. When examined microscopically the pith presents in section a union of hexagonal or polyhedral cells, resembling a honeycomb, of which a good example is afforded by the fabric known as Chinese rice-paper, which is the pith of *Aralia papyrifera*, found in the island of Formosa. The pith is at first succulent, and of a greenish colour; it afterwards becomes dry, and in the walnut, jessamine, horse-chestnut, and other plants its cells are broken up, leaving large cavities; whilst in the Umbelliferæ and grasses the entire pith gives way, owing to the rapid distension of the outer part of the axis, and then the stem becomes hollow. In its primary state the pith contains nutrient matter, and appears to be a reservoir of nourishment for the embryo plant. Its activity, however, soon ceases, hence about the end of the first year it commonly becomes dry and colourless. Not unfrequently it contains laticiferous (milk-bearing) vessels, as may be observed by severing a young branch of the fig-tree, when a quantity of milky juice is exuded from the lacerated part. The *medullary rays* connecting the pith and the bark consist of flattened quadrangular cellular tissue, having a resemblance to bricks in a wall, and therefore termed *muriform*. In the young stem these rays are large, but in the more advanced woody stem they appear as lines only. They constitute the 'silver-grain' so conspicuous in the maple and other woods. They rarely proceed in a continuous plane from end to end of the wood, but pass through the woody layers so as to be interrupted in their progress, and are thus split up vertically into numerous distinct portions, as may be observed by examining the surface of a stem from which the bark has been removed, or by making a section of the wood perpendicularly to the rays, that is tangential to the circumference of the stem. (See Pl. XXII.–XXIII.)

MEDUSA. See GORGONS.

MEDUSIDÆ, the order of Hydrozoa (Cœlenterate animals), represented by the typical Jelly-fishes, or 'Sea-blubbers,' as they are popularly designated. As already explained under the article JELLY-FISHES (which see), many forms which were regarded as true Jelly-fishes or Medusæ are now ascertained to be the free-swimming reproductive bodies of Zoophytes; and in consequence the order Medusidæ now includes a very small number of forms compared with those that were of old classified within its limits. The Lucernaridæ (see LUCERNARIA) were formerly included with the Medusidæ under the name of *Pulmograda;* the Lucernaridæ corresponding in Professor E. Forbes' classification of the Pulmogrades to the section of Steganophthalmate ('hidden-eyed') Medusæ; whilst the ordinary Medusæ, as at present recognized, were classified to form the Gymnophthalmate ('naked-eyed') section of the Pulmograda. The Medusidæ are now made to form the type of a sub-class of the Hydrozoa, that of the Discophora ('disc-bearers'); and are defined as Hydrozoa which are free-swimming or oceanic in habits, the body consisting of a single swimming-bell or *nectocalyx*, from the upper part of which a single organism or *polypite* is suspended. Throughout the swimming-bell a system of canals may be traced, several of which, running from the centre towards the margin of the bell, are termed *radiating canals;* whilst these latter are joined together by a single canal running round the edge of the bell, and which is known as the *circular canal*. The central polypite or *manubrium* possesses a terminal opening or mouth, and communicates by its upper and attached extremity with the canals above mentioned. The margin of the bell is fringed with *tentacles*, and in this situation the so-called *marginal bodies* are also found; these latter consisting, firstly, of *vesicles* containing fluid and particles of lime, and secondly,

of *pigment spots* or *ocelli*. To the former the function of ears or hearing-organs has been ascribed, whilst the latter have been regarded as rudimentary organs of vision. These opinions relative to the functions of the marginal bodies, it is but right to state, have been opposed as incorrect. From the fact of the marginal bodies in the Medusidæ being unprotected by a 'hood' as in the Lucernarida, these forms, as already mentioned, are known as 'naked-eyed' Medusæ (Gymnophthalmata). The mouth of the bell is generally closed by a membrane—the *velum* or *veil*—in which an aperture exists. In their reproduction the true Medusidæ give origin to forms directly resembling the parents, and which do not pass through any transitional stages, as observed in the development of those Medusa-like forms, which are merely the free-swimming generative bodies of Zoophytes. In the true Medusidæ the offspring are produced from true ova and by *sexual reproduction*, and not, as in the generative bodies of Zoophytes, by gemmation or budding. The Medusidæ are familiar to every sea-side visitor who sees these diminutive forms propelling themselves gracefully through the sea by alternately expanding and contracting the clear, glassy swimming-bell. In summer the seas around our coasts swarm with these animals, and by night appear luminous from the phosphorescent light which they are capable of emitting. (Pl. CLXIII.-CLXIV.)

MEDWAY, a river, England, which rises in the county of Sussex, flows N.N.E. in a winding course across Kent, past Tunbridge and Maidstone, to Rochester and Chatham, where it becomes a tidal stream of great depth, its reaches forming a safe and commodious harbour for the royal navy. Below Chatham it spreads out into a broad estuary, in which are several islets, and joins the Thames at Sheerness. It is navigable to Penshurt, 20 miles above Chatham, direct distance.

MEERANE, a town, Saxony, 12 miles N.N.E. of Zwickau, with the ruins of an old castle, manufactures of woollens, dye-works and other manufactories. This town has grown recently from an insignificant country town to a manufacturing centre. Pop. (1880), 22,293.

MEERSCHAUM, a name given to one of the silicates of magnesium. See MAGNESIUM.

MEERUT, or MIRAT, a town of Hindustan, in the division and district of the same name, between the Jamna and the Ganges, 36 miles north-east of Delhi. It is surrounded by a dilapidated wall inclosing a large area, which is occupied for the most part by narrow dirty streets and wretchedly-built houses. None of the mosques and pagodas possess any merit, and not a few of them are in ruins. The building most deserving of notice is the church, which is one of the largest in India, possesses an excellent organ, and is surmounted by a lofty and handsome spire; there are also two missionary churches, soldiers' chapel, and Roman Catholic chapel, government schools, hospital, military prison, two hotels, theatre, &c. There is here a large British cantonment for troops, situated 2 miles north of the town. Meerut has acquired a melancholy celebrity as the scene of the first great outbreak among the sepoys in 1857, and of the gross mismanagement which allowed them first to spend a whole night in pillage and murder, and then proceed unmolested to make themselves masters of Delhi. Being at an altitude of 800 feet above the sea, Meerut is an agreeable and salubrious residence. Pop. (town and cantonments), 99,565 in 1881.

MEGACEROS (Greek, *mega*, great; *keras*, horn), the name given to an extinct genus of Cervidæ or deer, popularly known as the 'Irish elk' (*Cervus megaceros*, or *Megaceros Hibernicus*), the remains of which are most plentifully, though not exclusively, found in the Post-pliocene deposits of Ireland. Its remains also occur in England in deposits of a similar age. The Irish elk was a true deer, and appears to have been intermediate in structure between the existing fallow-deer and reindeer. It was remarkable for the large size of the antlers, and from the fact of these structures exhibiting a conformation not seen in any living species of deer. The 'beam' or main branch expands greatly, and branches towards the tips of the horns; and in the mode in which the appendages or branches are given off several marked peculiarities are apparent. In some specimens the antlers measure 10 feet from tip to tip. (See Pl. LXXXVI. fig. 58.)

MEGÆRA, one of the Furies. See EUMENIDES.

MEGALONYX, an extinct genus of Edentate Mammalia, allied to the Sloths, &c., the fossil remains of which are found in post-tertiary deposits in North and South America. This form possessed no incisors or canine teeth, the only teeth represented being ten upper and eight lower molars. These teeth were further excavated or hollowed out in the centres of the crowns, and a prominent edge of margin was thus left around the cup-like cavity of each tooth. The hind limbs were longer than the anterior extremities; and the average size attained by the Megalonyx appears to have been about that of a horse. This form was probably arboreal in its habits.

MEGALOSAURUS (Buckland), a genus of extinct reptiles included in the order Deinosauria. The Deinosaurians exhibit somewhat abnormal features in their structure, the consideration of which has led zoologists to consider them as presenting us with types of forms intermediate between reptiles and birds. Huxley has proposed the term *Ornithoscelida* for the order Deinosauria, together with a curious aberrant reptilian form named *Compsognathus*. The Deinosauria were generally of very large size, the remains of some forms giving evidence of a length of 60 feet. The remains of the Megalosaurus are found in the lower oolite rocks, in the upper oolites, and in the weald clay of the cretaceous or chalk rocks. Its length is estimated to have been at least 40 feet. The teeth were fitted for a carnivorous dietary, and were of large size and of powerful structure. They were somewhat recurved in position; conical in general conformation; and the edges were toothed or serrated; whilst their positions at different stages of growth, as pointed out by Dr. Buckland, must have constituted them exceedingly efficient organs for tearing and lacerating the flesh upon which the animal fed. The thigh and shin bones of the Megalosaurus measure each about 3 feet in length; and that it was terrestrial in habits has been judged from the position of the head of the thigh-bone relatively to its shaft, and from the fact that the long bones were not 'pneumatic'—that is, filled with air instead of marrow. The hinder limbs far eclipsed the front members in length and size. The body was unprotected by an exoskeleton.

MEGARA. See MEGARIS.

MEGARIS, a small district or state of ancient Greece, bounded north by Bœotia, east by Attica, south by the Saronic Gulf and the territory of Corinth, west by the Corinthian territory and the Corinthian Gulf; area, about 143 square miles. It is a very mountainous country, the only plain being that on which the capital was situated. Mount Cithæron was on the north boundary, separating it from Bœotia. The only important town was Megara, situated a mile from the sea, opposite the island of Salamis. It contained a Pelasgian citadel, called Caria, on a hill north-west of the city, with a temple to Demeter called Megaron, from which the name of the town is

supposed to be derived. Another citadel of more modern date is situated on a lower hill to the south-west, and the town lies at the foot of the two. A seaport, Nisæa, was connected with it by two walls. The first known inhabitants were Leleges. It had flourishing colonies at an early period, and its navy was so powerful that it was only after a long struggle with it that Athens obtained possession of Salamis. It afterwards became annexed to Attica, of which Megaris formed one of the four ancient divisions. It was successively conquered by the Dorians and the Corinthians, but afterwards asserted its independence, and became wealthy and powerful. Euclid was a native of Megara, and founded a celebrated school of philosophy in it. In the Roman period it ceased to be a place of any importance.

MEGATHERIUM, a genus of extinct Edentate Mammalia, closely allied to the existing Sloths, from which, however, it differed in being of large size, and in being terrestrial in habits. The remains of this form occur in post-tertiary or recent deposits in South America, in close relation with the remains of other extinct Edentates, such as the Mylodon, Megalonyx, Glyptodon, &c. That these forms coexisted in South America cannot be doubted; and the fact that South America in the present day forms the head-quarters of distribution for edentate mammals of smaller size and of different types from these extinct beings, exemplifies an admirable illustration of the law known to naturalists under the name of 'geographical succession of organic forms.' This law, briefly stated, holds that in *recent geological periods the same mammalian forms*—to use the Mammalia as examples—*inhabited the same regions as at present*, the forms of these recent periods being *specifically* distinct from their existing representatives, but the essential characters of the order or group being perpetuated in the same locality. Thus in South America the characters of the extinct sloths and armadilloes are perpetuated by modern but different species of these animals, occupying the same geographical area as these recent geological and gigantic forms. Similarly Australia had in the recent past its gigantic marsupials, the characters of which are perpetuated in the existing kangaroos. The South American llamas were represented in post-tertiary times by the extinct llama *Marauchenia;* and these examples therefore illustrate this law, which is succinctly expressed by Sir Charles Lyell, who says that 'the *present* distribution of organic *forms* dates back to a period anterior to the origin of *existing* species.'

The Megatherium must have attained a considerable size, the specimen in the British Museum measuring 18 feet in length. Its skeleton exhibits proportions rivalling those of existing elephants, the limbs in particular being strongly built. The toes are large and provided with claws, and are adapted for walking. The tail-vertebræ are largely developed. Clavicles or collar-bones are present in the Megatherium, and in its dentition it agrees with existing sloths, both as to the number and kinds of teeth present. No incisors or canines were developed; the upper jaw possessed ten and the lower jaw eight molars. The substance of the teeth was periodically renewed, to repair the loss occasioned by the attrition of the rough vegetable tissues on which the animal fed. In form each molar was quadrangular. The crowns possessed strong transverse ridges; and the teeth sprang from pulps which continued to grow throughout the entire lifetime of the form. The tongue was large and muscular, as is proved by the elongated anterior part of the lower jaw, this structure enabling it to lop off the foliage of trees like the existing giraffe—the trees having been felled by the prodigious strength of the Megatherium. The *Megatherium Cuvieri* and the *M. mirabile* are two familiar species.

MEGRIM, a species of headache, a pain generally affecting one side of the head, towards the eye or temple, and arising sometimes from the state of the stomach, sometimes from rheumatic and gouty affections. In French it is called *migraine*, derived from *hemicrania*, from the Greek *hemi* (signifying in compound words, half) and *cranion* (the skull). It affects chiefly persons of weak nerves.

MEHEMEDI ALI, Viceroy of Egypt, the sixteenth son of a Turkish Aga, was born at Kavala, in Macedonia, in 1769. Being early left an orphan he was brought up by the governor of his native town. Having given proof of capacity in collecting the taxes from an insubordinate village, the governor gave him a relation of his own in marriage, and appointed him an officer in the militia. On the invasion of Egypt by the French he accompanied the troops furnished by his native town (1799) first as the lieutenant of the governor's son, and afterwards, on the speedy return of the latter, as their colonel. He distinguished himself at the battle of Ramanieh, procured rapid promotion, and finally became the confidant and adviser of Koshrew, pasha of Egypt. Taking advantage of the struggle between the Mamelukes and the pashas, he succeeded by a series of acts of treachery to both parties in making himself master of Egypt, and on 9th July, 1805, was recognized by the Porte as Pasha of Cairo, with the dignity of a pasha of three tails, a dignity which he bought by secret bribes as well as promises of tribute. He was subsequently appointed Pasha of Alexandria, and afterwards of all Egypt. In 1811 he massacred the Mamelukes to the number of 470 in Cairo, and about 1200 over the country. He then commenced, by the orders of the Porte, a war of six years' duration against the Wahabees of Arabia, which was brought to a successful conclusion by his son Ibrahim, and secured him the possession of Hejaz. His domestic government was conducted with great vigour. He succeeded, though by oppressive measures, in reducing the finances of Egypt to order; he organized an army, a navy, and arsenals on a European model. He seized all the land of Egypt, giving only life pensions to the proprietors. He also assumed a monopoly of commerce and industry. With the aid of foreign projectors, particularly of Frenchmen, to whom he was partial, he gave a new direction to agriculture, making cotton a staple product of Egypt, and introducing or extending the cultivation of other products. He also organized manufactures, and encouraged trade, giving new life to the industry of Egypt. These schemes were interrupted by new wars. In pursuing his advantages against the Mamelukes he had brought Nubia and Kordofan under his sway. In 1824–27 he assisted the sultan in endeavouring to reduce the Morea, which led to the destruction of his fleet by the allied European powers at Navarino, 20th October, 1827. As the price of his co-operation he received the island of Candia, but he aspired at independence and at extending his dominion over Syria. A pretext for attacking that country was found, and in 1831–32 his son Ibrahim succeeded in effecting its conquest. Peace was made by the intervention of the European powers, and he received the investiture of four pashaliks of Syria, as a vassal of the Porte. Neither he nor the sultan were satisfied with these terms. War broke out again in 1839, before the death of Sultan Mahmoud, and the new sultan, Abdul Medjid, being unable to expel him from Syria, obtained the assistance of the European powers. Mehemet was compelled to agree to a treaty which gave him the here-

ditary Pashalic of Egypt, on his resigning Syria, Candia, and Hejaz. This was confirmed by a Hatti Sheriff of 13th February, 1841. Towards the close of his life Mehemet fell into a state of imbecility, and in September, 1848, was superseded in the government by his son Ibrahim, who died in November of the same year. Mehemet died on 2d August, 1849, and was succeeded by his grandson Abbas Pasha.

MÉHUL, Étienne Henri, a celebrated musical composer and member of the Institute of France, born at Givet, in 1763, received his first lessons from a blind organist at his native place, and became such a proficient that, at the age of twelve, he was appointed joint-organist to the abbey of Valbedieu. The desire of improving his talents attracted him to Paris in 1779. He there studied under Gluck; and after the departure of the latter for Vienna Méhul presented to the Royal Academy of Music the opera of Cora and Alonzo, the representation of which was delayed for six years. He turned with disgust to the Opéra Comique, which gladly received his Euphrosine and Coradin in 1790. This was followed at different periods by Stratonice, Irato, Joseph, and other operas, to the number of forty-two, besides ballads, sonatas, symphonies, and cantatas, &c. His patriotic hymns, which contributed materially to immortalize his name, le Chant du départ, le Chant de Victoire, and le Chant de retour, were composed about 1794. Méhul was one of the three inspectors of instruction at the Conservatory of Music, from its creation in 1795 till its reconstitution in 1815. He was then appointed superintendent of music at the king's chapel, and professor of composition at the Royal School of Music. He was chosen a member of the Institute in 1796, of the Academy of Fine Arts in 1816, and a knight of the Legion of Honour in 1802. He died at Paris 1817. Méhul read before the Institute two reports: Sur l'État Actuel de la Musique en France, and Sur les Travaux des Elèves du Conservatoire à Rome. His style as a composer is remarkable for dramatic force and colouring, which he held to be indispensable in theatrical compositions.

MEININGEN, a town in Germany, capital of Sachsen-Meiningen, in a narrow valley surrounded by wooded hills, on the right bank of the Werra, 40 miles S.S.E. of Erfurt. The older part of the town is very indifferently built, but the modern part is both regular and handsome. It has a palace, in which the duke resides, containing various collections of art and natural history, three churches, one of them containing curious monuments of knights; a gymnasium, infirmary, theatre, barracks, several schools, and benevolent establishments. Neither the trade nor manufactures are of importance, though there are ten annual fairs. Pop. (1880), 11,227.

MEISSEN, an ancient town of Saxony, founded by Henry I. in 922-933, 14 miles W.N.W. of Dresden, on the left bank of the Elbe, here crossed by a fine bridge. The position of the town, the loftiness of its houses, and the conspicuous objects presented by several of its public edifices, give it a very striking appearance at a distance, but it is in general very indifferently built, and its streets are narrow and gloomy. It has a noble Gothic cathedral, of the tenth century, with a lofty spire of open work, and some beautifully-painted glass; the old castle of the Margraves, erected in the fifteenth century at vast expense, on a precipitous rock above the town, now converted into a porcelain factory, at which the finest Dresden china is made; the Franciscan church, a large and magnificent edifice, used as the custom-house; the church of Our Lady, the town-house, cloth-hall, and the Afranum, a large and richly-endowed school or college, with several valuable collections. One of the most interesting sights in the town is the porcelain factory already mentioned, and first established by Böttcher. (See Bettcher.) This is now the great staple of the place; but there are also manufactures of worsted, tobacco, leather, safety-matches, stoves, &c. There are also several iron-foundries, machine factories, a jute-mill, breweries, sugar-refineries, dye-works, and printing establishments. The trade, chiefly in wine and fruit, is considerable. Meissen is the see of an archbishop. Pop. (1881), 14,166.

MEISSNER, August Gottlieb, born at Bautzen in 1753, studied law and literature at Leipzig and Wittenberg from 1773 to 1776, and died at Fulda, where he was director of the high-school, in 1807. He was also for some time professor of æsthetics and classical literature at Prague. His works were at one period very popular in Germany. A glowing imagination, an easy style, grace, wit, and a brilliant manner, united with a delicate tone of gallantry, were the causes of his success. His principal productions are comic operas, in the French style; Sketches, a miscellaneous collection of anecdotes, tales, &c.; several historical romances, as Alcibiades, Bianca Capello, &c. He also translated Hume's History of England.

MEKONG, Mekon, or Cambodia. See Cambodia.

MELA, Pomponius, a geographer who flourished during the first century of the Christian era, probably under the Emperor Claudius. Little more is known of him than that he was a native of Spain, and the author of a treatise in three books in the Latin language, De Situ Orbis, containing a concise view of the state of the world so far as it was known to the ancient Romans. The best edition is that of C. H. Tzschuckius (Leipzig, 1807, seven vols. 8vo). There is an excellent edition with notes by G. Parthey (Berlin, 1867).

MELANCHOLY. See Insanity.

MELANCHTHON, or Melanthon, Philipp (the latter form is that which he himself usually wrote), Luther's fellow labourer in the work of the Reformation, was born at Bretten, in the Rhenish Palatinate, on 16th Feb., 1497. His original name was *Schwarzerd* (= black earth), of which Melanchthon is the Greek equivalent. His father, whose name was George, was armourer to the Pfalzgraf, and died in 1507; his mother, named Barbara, was a kinswoman of Reuchlin. He attended the school of Pforzheim, and so early as 1510 entered the University of Heidelberg, where in 1512 he took the degree of Bachelor of Philosophy, and became the tutor of some young counts; but in the same year he went to Tubingen, devoted himself, in addition to his previous studies, to theology, and having in 1514 attained his degree of Master, delivered lectures on the Aristotelian philosophy and the classics. The solidity of his learning, which was proved at this time by the issue of a Greek grammar, and his eloquence as a lecturer, gained him universal esteem, and excited the wonder of Erasmus. Through the recommendation of Reuchlin he was called in 1518, as professor of the Greek language and literature, to Wittenberg. He soon decided for the newly promulgated evangelical doctrines, and his classically trained judgment, his dialectical and exegetical acumen, the uncommon clearness with which he treated every subject, and his prudence and moderation in dealing with opponents, contributed as much to the progress and prosperity of the Reformation as the zeal and enterprise of Luther in pushing forward and defending the movement. Already, in 1519, in the literary war which followed the Leipzig disputation, he came

forward as a champion of Luther's opinions. Two years later appeared his Loci Communes Rerum Theologicarum, a work which set the example of a scientific exposition of the Christian faith, and became the model of subsequent works on Protestant dogma. His Visitations-artikel (Instructions to the Visitors) of 1527, drawn up at the request of the Elector John, encroached directly on the constitution of the Saxon Church, and gave the visitors of the church new directions on the doctrines to be taught to the people, and on the most important points in church and school organization. While in this paper he softened many points of contention, he showed uncompromising decision in the Protest of Spires (1529), which gave its name to the party; and in drawing up the Augsburg Confession (1530) he displayed a marvellous strength of religious conviction, combined with a prudence which embraced every requisite consideration. This master-piece, together with the apology for the Augsburg Confession, which he drew up shortly afterwards, carried his name throughout Europe, brought him an invitation from Francis I. to visit France, and assist at a conference for accommodating the religious differences of that country. It also brought him an invitation to England. From political considerations he declined both invitations, but other inducements to travel presented themselves, partly for recreation, and partly in connection with the religious concerns of his party. On a journey which he undertook to attend a religious conference at Hagenau, in 1541, he was taken ill at Weimar. Luther hastened to him, and believed that his life was spared in answer to his prayer alone. The conference at Hagenau did not take place, and he went in 1541 to Worms, and shortly afterwards to Ratisbon, to conduct the affairs of the Protestants in a conference for reconciliation with the Catholics. He had, however, the mortification to find that the peace he ardently desired was not to flow from these conferences, and had, besides, bitter reproaches to undergo from his own party for the concessions made by him in them. A like experience befel him when, called by the Elector Hermann to Cologne, he tried to introduce the Reformation there in a spirit of toleration for the Catholics: although neither Luther nor any of his friends ever doubted the purity or truth of his zeal for the Reformation. The friendship between him and Luther, though often tried by their difference of temperament, continued unbroken till the death of the latter, upon which Melanchthon honoured him with a biographical memorial. A great part of the confidence which had been reposed in Luther was now bestowed on Melanchthon. The spirit of concession which he had repeatedly manifested was, however, far from being acceptable to the theologians. He had already gone to the utmost verge of concession; and it was not without reproach of conscience that, after the unfortunate result of the Schmalkaldic war, he agreed to the Leipzig Interim, which restored the greater part of the Catholic ceremonies. In the controversy which rose about these concessions he was looked on almost in the light of a traitor. Other subjects of contention arose in regard to doctrinal points. On the Lord's supper he approximated to the Calvinistic or Zwinglian view, which had been so vehemently opposed by Luther, and in opposition to the doctrine of the universal corruption of human nature he maintained the co-operation of the free-will of man in his conversion and the necessity of good works. The alterations which he had made in the Augsburg Confession during Luther's lifetime, and which had long passed unquestioned, were now regarded as conclusive proof of declension from orthodoxy. Melanchthon had always differed somewhat from Luther in the development of his doctrines, but the Lutheran doctrines had, since the death of Luther, acquired a systematic rigidity which was now held up to him as the standard of evangelical truth. All these things caused many vexations to Melanchthon, whose sensitive frame was already exhausted with numerous labours. He had thus little cause for regret when the war between the Elector Maurice and the emperor prevented his participation in the Council of Trent, to join which he had already, in January, 1552, journeyed as far as Augsburg. His orthodoxy was recognized by the theological convention of Naumburg in 1544, but a final attempt which he made in 1557, at the convention of Worms, to bring about a reconciliation with the Catholics, again proved a failure. This effort to restore the unity of the church was his last public work. He died at Wittenberg, 19th April, 1560. By his excellent and often printed Latin text-books on Rhetoric and Philosophy, such as De Dialectica, De Anima, Epitome philosophiæ moralis, &c., Melanchthon deservedly earned the title of Præceptor Germaniæ. His life has been written by Joachim Camerarius. The latest complete edition of his works has been included by Bretschneider and Bindseil in the Corpus Reformatorum, in twenty-eight volumes, Brunswick and Halle, 1834–60. A life and selection of his works were published at Elberfeld, 1861.

MELANESIA (Gr. *melas*, black, and *nesos*, island), the name given to a group of islands (many of them of considerable size) stretching from the north-east of New Guinea (according to some geographers including that island) near the equator, south-eastwards nearly to the tropic of Capricorn. It thus includes the following subsidiary groups:—New Britain Archipelago (with the Admiralty Islands), Solomon Islands, Queen Charlotte or Santa Cruz Islands, New Hebrides, New Caledonia, Loyalty Islands, and the Fiji Islands. See separate articles under the more important of these headings.

MELANITE. See GARNET.

MELBOURNE, a city in Australia, capital of the colony of Victoria, on the Yarra, 445 miles south-west of Sydney, and about 2½ miles (8 miles by water) from Port Philip Bay, upon which is its port, called Sandridge, possessing large and commodious piers, capable of accommodating vessels of almost any tonnage. It is connected with the city by the Melbourne and Hobson's Bay Railway. Melbourne was founded during the premiership of Lord Melbourne, after whom it was named. It was incorporated in August, 1842, and in 1848 erected into an episcopal see. The city and its suburbs stand on a large block of land, which is mostly hilly and undulating, with the Yarra winding through it. The city proper is so closely connected with its suburbs as to practically form one town with them; the city itself being the central and most important business part of the whole. It forms a regular parallelogram, having five principal streets about a mile long and 99 feet wide, running parallel to the Yarra, and intervening between which are narrow streets 33 feet wide, called by the names of the principal streets, with the prefix *Little*. These are crossed by streets about half a mile long, which are generally hilly; but the centre one, Elizabeth Street, is nearly level, and in rainy weather is flooded, and becomes an impassable torrent. Arrangements are being made for underground drainage. There are numerous other streets in the outskirts of the city, while the important suburbs of Collingwood, North Melbourne, Fitzroy, Carlton, Brunswick, Emerald Hill, South Yarra, Prahran, Richmond, &c., can boast of fine thoroughfares with well-built business premises, as well as private houses. A system of planting trees in the main thoroughfares has been inaugurated,

which, in a city where the heat is so intense and the dust so annoying in summer, cannot but be productive of the best results in the way of comfort and ornament. The whole city is well lighted with gas and paved, and provided with an abundant supply of water. The public buildings are generally substantial and imposing in appearance. The most remarkable are the Houses of Parliament, a huge pile of brickwork with four freestone fronts; the Treasury, a fine freestone edifice, behind which stand the government offices; the law-courts, with four handsome fronts, each about 300 feet long, the whole surmounted by a magnificent cupola; the free library, containing over 108,000 volumes; the mint, a very handsome quadrangle; the university, with an admirable museum attached; the Ormond Presbyterian College; the town-hall, having a room capable of seating about 3000 persons, and containing one of the largest and finest organs in the world; five large markets; the Athenæum, with a library of over 16,000 volumes; the Melbourne, Alfred, lying-in, and children's hospitals, asylums for the blind, the deaf and dumb, and the aged and infirm; several theatres and music-halls, the Anglican and Roman Catholic cathedrals and numerous churches; several colleges, and many schools; the buildings erected for the international exhibition of 1880; the exchange, and many large banks, business premises, and hotels. There are several public parks, a botanical garden, and a splendid race-course. There is access to the very centre of the city for steamers and vessels of considerable size by means of the river Yarra, along which there are several wharves, shipyards, a dry-dock, &c. By its railway systems Melbourne is connected with all the principal towns of the Australian continent. As regards industries the chief products are leather, clothing, furniture, flour, preserved meats, soap, candles, ales, cigars, iron-ware, woollens, confections, &c. Population of city proper in 1881, 61,365; inclusive of suburbs, 282,981.

MELBOURNE, William Lamb, Viscount, a British statesman and minister, born in 1779, was the oldest son of Sir Peniston Lamb, who became in 1770 an Irish peer under the title of Lord Melbourne, in 1781 a viscount, and in 1815 a peer of Great Britain. Young Lamb was educated at Eton and Oxford, and then commenced the study of the law. In 1805 he obtained a seat in the House of Commons, and joined the moderate Whigs, but did not particularly distinguish himself. His literary talents, however, were well known, and he wrote a play entitled the Fashionable Friends. At a later period he gave in his adhesion to Canning, who in 1827 appointed him secretary for Ireland. He shortly after resigned this situation, and on his father's death in 1828 entered the House of Peers. On the formation of the Grey ministry in 1830 he became home-secretary, and in 1834, when Earl Grey resigned, he was placed at the head of the administration. He found it impossible to maintain his ground, and was obliged to yield the helm of the state to Wellington and Peel, who in their turn found it necessary to resign in 1835. Lord Melbourne was now again employed to form a ministry, and succeeded, though with considerable difficulty, in maintaining his place for six years. After the accession of Queen Victoria he stood high in favour at court, but his administration gradually sunk, till a general want of confidence compelled him to make way for the Peel ministry of 1841. When his party again succeeded in 1846 he declined, on the ground of old age, to take any part in the government. He died in 1848.

MELCHITES (Syrian *malkâyé*, royalists), a name given by the Monophysites to the orthodox Christians in the East, who accepted the decrees of the Council of Chalcedon condemning their heresy, and which were ratified by the emperor. It is still given to the adherents of the Roman Church in Syria and Egypt, where monophysitism is prevalent.

MELCHIZEDEK (that is, king of righteousness) is called in Gen. xiv. 18 *King of Salem* and *priest of the most high God*. He is there stated to have offered Abram bread and wine after the victory of the latter over the four kings, to have blessed him, and to have received tithes of the booty. He is mentioned (Heb. vi. 20; vii. 1–22) as in various specified respects a type of Christ, who is there called a *high-priest for ever after the order of Melchizedek*.

MELEAGER, the son of Œneus, king of Calydon; according to some of Ares and Althæa. When he was but a few days old the Fates declared that he should die as soon as a brand that was burning on the hearth was consumed; his mother therefore snatched it from the fire and carefully preserved it. Meleager accompanied the Argonautic expedition, and distinguished himself particularly at the Calydonian hunt. He killed the boar, and gave its skin as the highest token of regard to his beloved Atalanta. The brothers of his mother—Idrus, Plexippus, and Lynceus—conceiving themselves to have been injured, robbed Atalanta of the skin while she was returning home to Arcadia. Meleager, unable to persuade them to restore the skin, slew them all three. His mother, in a sudden burst of anger at the death of her brothers, threw the brand on which his life depended into the fire, and Meleager died. Others say that his mother cursed him, and in returning from an expedition the Erinnys, who had heard the curse, killed him.

MELEGNANO. See Marignano.

MELFI, a town of Southern Italy, province of Basilicata, on a lofty volcanic height, 75 miles E.N.E. of Naples. It is surrounded by dilapidated walls, and defended by an old castle, and had a beautiful cathedral and several convents, most of which, with many others of its buildings, were destroyed or damaged by an earthquake in 1851. The same disastrous event killed many of the inhabitants. Its chief trade at present is in an excellent wine, the growth of the district. Pop. 9803.

MELICERTES. See Athamas and Ino.

MELILOT (*Melilotus officinalis*), a leguminous plant, a native of Europe, now naturalized in some parts of the United States. The root is biennial, and gives out one or several stems, which attain the height of 1 or 2 feet, and are provided with trifoliate leaves; the leaflets are obovate and serrated; the flowers are small, numerous, pale-yellow, and are disposed in long racemes in the axils of the superior leaves; they are succeeded by an ovate, compressed, one or two seeded legume. When fresh the plant has a slight odour, which becomes stronger and very pleasant after it has been dried. It seems to render hay more agreeable to the taste of cattle; sheep and goats are very fond of it. It is adapted to every kind of soil, but in general is not cultivated separately. The celebrated Gruyère cheese is said to owe its excellence partly to the flowers and seeds of this plant, which are bruised and mixed with the curd.

MELINDA, a seaport town, Eastern Africa, on the coast of Zanzibar, lat. 3° 0′ S.; lon. 40° 20′ E. It is large and handsome, the houses built of stone; has numerous mosques, but its churches and other buildings, erected by the Portuguese, who possessed it for some time, are now in ruins. The anchorage is at a considerable distance, and the coast shallow and beset with rocks and shelves. A very considerable trade is carried on by caravan with the interior, and by sea with the Red Sea, Persia, and the northern parts of India. The exports consist of ivory, gold,

copper, wax, and drugs, in exchange for silks, cottons, linen cloths, and European commodities. Vasco da Gama visited Melinda in 1498. He was kindly received, and furnished with pilots to proceed to India. Melinda is also the name of the district in which the town lies, bounded by Zanzibar on the south.

MELISSUS, a Greek philosopher, son of Ithagenes, and a native of Samos. He is said to have been a friend of Heraclitus, and to have commanded the fleet opposed to Pericles in 440 B.C. in the Samian war. Some fragments of a prose work of his, written in the Ionic dialect, have come down to us, and have been collected and published by Brandis and by Mullach (Berlin, 1846). From these he appears to have been a philosopher of the Eleatic school, and to have reached more definiteness and consistency than Parmenides.

MELITA. It is related in the Acts of the Apostles that Paul, on his voyage to Rome, was cast away on the Island of Melita. This has generally been considered to be the Island of Malta, the ancient name of which was Melita; but some critics have attempted to prove that it was an island (the modern *Meleda*) on the coast of Dalmatia, in the Adriatic.

MELITOSE, the name given to a kind of sugar obtained from Tasmanian manna.

MELLITIC ACID. This acid was discovered by Klaproth in 1799; he prepared it from *honey-stone* or *mellite*, in which it exists as ammonium mellitate. Mellitic acid forms delicate silky needles, which have a strongly acid taste, dissolve easily in water and alcohol, and are permanent in the air. The recent researches of Baeyer have shown that the formula of this acid is $C_{12}H_6O_{12}$, and that it is hexabasic and hexatomic, or, in other words, that it contains the group carboxyl six times; its structural formula therefore becomes $C_6(COOH)_6$. This acid is chiefly interesting as being the last in the series of acids derived from benzene—C_6H_6—by the replacement of hydrogen by means of the group COOH. By treatment with lime mellitic acid is resolved into carbon dioxide and benzene, $C_6(COOH)_6 = C_6H_6 + 6CO_2$.

MELODRAMA (from the Greek *melos*, song, and *drama*, action), originally and properly a half-musical drama, or that species of drama in which the declamation of certain passages is interrupted by music. It differs from the opera and operetta in this, that the persons do not sing but declaim, and the music only fills the pauses, either preparing or continuing the feelings expressed by the actors. Generally the subject is grave or passionate. The first idea of a melodrama was given by J. J. Rousseau in his Pygmalion, composed about the middle of the eighteenth century. Towards the end of that century the word came to be used in France in a different sense; and this new sense has remained attached to the word and been transplanted into England. This new signification is that of a tragedy of common life, filled with surprises, acts of violence, and all that excites and sustains the attention of the audience, mixed up with dancing and music, and sometimes with scenes of a rudely comic character. Probability is freely sacrificed for the sake of striking situations. The name is also applied to a dramatic performance in which the plot is of the flimsiest description, and merely intended to afford opportunities for the display of gorgeous scenery and decorations.

MELODY, in the most general sense of the word any successive connection or series of tones; in a narrower sense, a series of tones which please the ear by their succession and variety; and in a still narrower sense, the particular air or tune of a musical piece. By melody in its general musical sense the composer strives to express particular states of feeling or disposition, which, in pieces for several voices, is chiefly effected by the principal melody or chief voice, to which the other voices, with their melodies, are subordinate. The elements by which the composer is enabled to express a variety of sentiments and feelings, by means of the melodious connection of tones, are the variety of tones in themselves, and the variety of transitions from one tone to another, to which is still to be added the variety of the movements in which music proceeds (rhythm). Melody and rhythm are the true means to awaken delight, and where they are wanting the greatest purity of harmony remains without effect. The proper essence of melody consists in *expression*. It has always to express some internal emotion, and every one who hears it, and is able to understand the language, must understand the feeling expressed.

MELOE (Pl. LXVII.-LXVIII. fig. 10), a genus of Beetles (Coleoptera) belonging to the tribe Heteromera, the members of which possess four joints in the hinder pair of feet; the other four members possessing five joints. The species of meloe are allied to the Cantharis or genus of Blister Beetles, not only in structure, but also in respect of the vesicatorial or blistering properties which distinguish these latter forms. Several species of Meloe inhabit Britain. They are soft-bodied sluggish insects, possessing no hinder wings, but having the front pair in the form of short elytra or wing-covers, extending about half the length of the body. The middle segments of the antennæ or feelers are the longest. The head is large and prominent. They inhabit grassy or sandy places, and are most plentiful in the early summer months. The female insects are generally recognized by the distended abdomen, filled with eggs; and the larval forms appear to attach themselves parasitically to wild bees in a manner similar to the larvæ of the well-known Stylops or bee-parasite (see PARASITE), a strepsipterous insect. By Linnæus the Cantharis or Blister Beetle was included in the same genus with the Meloe, but in modern entomology these insects have been included in separate genera. The larvæ are known in Germany by the name of *Maiwurm* (May-worm); and these immature forms appear to protect themselves by the exudation at will of a yellowish or reddish liquid possessing caustic properties. The common species is the *Meloe proscarabeus*, found in Europe generally, and common about the month of April in the suburbs of Paris. This species is said to be occasionally mixed with the true cantharides by the Spaniards, or even to be used as a substitute for the latter insects. The blistering properties appear to be best developed in the insects inhabiting the most southern regions; the development of the vesicatorial properties being thus apparently associated with a warm or tropical habitation. Latreille was of opinion that the Meloe was the *Buprestis* of the classical nations, these insects being said to cause the death of cattle which chanced to swallow them. In America several species of Meloe are found, the *M. purpureus* being the largest of these.

MELON, the fruit of the *Cucumis melo*, belonging to the natural order Cucurbitaceæ, comprehending the melon, the cucumber, and some sorts of gourd. The Cucumis is a rough, trailing, herbaceous plant, having rounded, angular leaves, and yellow funnel-shaped flowers. Its annual root and rapid growth enable it to be cultivated in the short summers of northern climates; but the flavour of the fruit is much heightened by exposure to a hot sun. The form of the fruit is in general oval, but varies exceedingly in the different varieties, which are very numerous. In some the external surface is smooth; in others rugged or netted, or divided into segments by longitudinal grooves. The odour of the fruit is delightful. The flesh is usually yellow, and has a sugary and delici-

ous taste. It has been cultivated in Europe from time immemorial. Its native country is unknown.

The water-melon is the product of the *C. citrullus*, a plant somewhat resembling the preceding, but having the leaves deeply divided into lobes. It is smooth, roundish, often 1½ foot in length, and has a thin green rind. The seeds are black or red. The flesh is usually reddish, sometimes white, icy, and has a sugary taste; it melts in the mouth, and is extremely refreshing. It is cultivated to a great extent in all warm countries of both continents, and even in high northern latitudes. It serves the Egyptians for meat and drink, and is the only medicine used by them in fevers. *Cucumis utilissimus*, a native of India, produces a fleshy oval fruit, having much the flavour of the melon. The seeds, like those of other species of this natural order, contain farinaceous matter blended with a mild oil, both in considerable quantity. The seeds form an article of commerce in the Guntur Circar, to which district the cultivation of the plant is chiefly confined.

MELOS, now MILOS or MILO, an island belonging to Greece, in the Grecian Archipelago, in the south-east of the Gulf of Egina, one of the Cyclades; area, 64 square miles. It is mountainous, of volcanic formation, has hot mineral springs, and mines of sulphur and alum; its north coast is indented by a deep bay, which forms a safe and excellent natural harbour, with deep water. The island was once famous for its riches, fertility, and population. The staple produce is cotton. The inhabitants are either fishermen or sailors, and are reputed the best pilots in the Archipelago. Pop. 3490.—Milos is also the name of an eparchy of the nomarchy of the Cyclades, comprehending besides Milos itself and the opposite island of Antimilos, the islands of Sipheno, Sikino, and Polykandro, and containing a population of 10,784.

The island of Melos was first colonized by Phœnicians, and afterwards by Dorians. During the Peloponnesian war it was the faithful ally of Sparta till 416 B.C., when it was taken by the Athenians and its inhabitants massacred or sold as slaves. From 1204 till 1537 it formed part of the Venetian duchy of the Archipelago. At the latter date it was taken by the Turks, with whom it remained till the epoch of Greek independence. In 1820 a peasant discovered here the celebrated statue known as the Venus of Milo, now placed in the museum of the Louvre at Paris. There are also the ruins of an amphitheatre in the island.

MELPOMENE, one of the Muses, daughter of Zeus and Mnemosyne. She presided over tragedy. Horace has addressed one of his finest odes to her, as to the patroness of lyric poetry. She was generally represented as a young woman with vine leaves surrounding her head, and a tragic mask covering her face. Her garments were splendid; she wore a cothurnus, and held in her hand the club of Heracles or a sword.

MELROSE, a burgh of barony in Scotland, in the county of Roxburgh, 31 miles S.S.E. of Edinburgh. It derives its main importance from the ruins of the celebrated abbey, now the property of the Buccleuch family. Melrose Abbey is on all hands admitted to be the most beautiful of all the ecclesiastical ruins in the island. It was founded by King David in 1136; destroyed by Edward II. in 1322, and rebuilt by Bruce in 1326. It was partly demolished by the English in 1545. The public attention was first particularly drawn to it by Sir Walter Scott in his Lay of the Last Minstrel, and it has since become a favourite subject of the poet, the painter, and the tourist. Pop. of town in 1881, 1550.

MELTING-POINT, INFLUENCE OF PRESSURE ON. Professor James Thomson anticipated from the principles of thermodynamics[1] the truth that the melting-point of a body, such as ice, which contracts in melting, is lowered by pressure, while that of a body which expands in melting is raised by pressure; his idea was verified experimentally by his brother, Sir W. Thomson, who showed that a pressure of 16·8 atmospheres lowered the melting-point of ice from 0° C. to −0°·13 C. Mousson subjected ice to the enormous pressure of 13,000 atmospheres, lowering its melting-point to −18° C. Bunsen and Hopkins verified Thomson's conclusions in paraffin, spermaceti, wax, and stearin, which expand in melting. Professor James Thomson applied his conclusions in explaining the regelation of ice. (See ICE.) The ordinary melting-points of different substances are given in the following table:—

Mercury,	−39° C.	Bismuth,	563° C.
Ice,	0°	Lead,	320°
Butter,	33°	Zinc,	360°
Lard,	33°	Antimony,	432°
Spermaceti,	49°	Bronze,	900°
Stearine,	55°	Pure silver,	1000°
Yellow wax,	62°	Copper,	1150°
White wax,	68°	Coined gold,	1180°
Phosphorus,	44°	Pure gold,	1250°
Potassium,	63°	Cast-iron,	1050° to 1250°
Sodium,	95°	Steel,	1300° to 1400°
Iodine,	107°	Wrought-iron,	1500° to 1600°
Sulphur,	110°	Platinum,	2000°
Tin,	230°		

The higher points of this table are rather uncertain.

MELTON-MOWBRAY, a market-town in England, in the county of Leicester, and 14 miles north-east of the town of Leicester, on a branch of the Midland Counties Railway, on the right bank of the Eye or Wreak, here navigable, and crossed by two bridges. It consists of two principal streets, with substantially-built houses, and has a lofty and spacious cruciform parish church, with a beautiful porch and tower; places of worship for other denominations; several schools and almshouses; a considerable trade in pork pies, and more especially in Stilton cheese. The only manufactures of any consequence are bobbinet lace and worsted hosiery. The prosperity of Melton-Mowbray is greatly owing to its being the seat of the Melton Hunt, which attracts the sporting world in great numbers during the winter months. Pop. (1881), 5766.

MELUN (ancient *Melodunum*), a town in France, capital of the department of Seine-et-Marne, 27 miles south-east of Paris, on both banks of the Seine, and partly on an island in it, communicating with the opposite banks by two bridges. It is regularly and tolerably well built, and gains much in appearance by its handsome quays and fine promenades. The Gothic church of St. Aspais at Melun is remarkable for its fine windows. A bell-tower is all that remains of what was formerly the Abbey of St. Pierre. On the western part of the island are the ruins of the old castle of Melun, and an old tower, which tradition attributes to Julius Cæsar. The manufactures chiefly consist of woollens, cottons, and calicos. There are also tanneries and cotton-mills. The trade is in corn, flour, cheese, wool, and cattle. It is a very ancient town and is rich in historical associations. Here

[1] Professor James Thomson imagined a quantity of ice between the temperatures of 0° C. and −τ° C. (where τ is very small) to become a reversible heat engine, like that of Carnot; his reasoning is given in Balfour Stewart's Heat, § 401. His result is expressed in the now well-known form of the second law of thermodynamics $L = \frac{T}{J}(V_1 - V)\frac{dp}{dt}$, where L is the latent heat of unit mass of liquid, T is the absolute temperature of melting, J is Joules' equivalent, V and V_1 are the volumes of unit mass of solid and liquid, $\frac{dp}{dt}$ is the differential coefficient of pressure by temperature of melting.

the kings Robert and Philip I. died. Pop. (1881), 12,145.

MELVILLE, ANDREW, a distinguished Scottish reformer, and a man of remarkable erudition, born on the estate of Baldovy, or Baldowy, near Montrose, Aug. 1, 1545; died at Sedan in 1622. He was educated first at the University of St. Andrews, where he acquired considerable reputation for his general learning, but particularly for his knowledge of Greek, a reputation which he sustained at the University of Paris, where he spent the years 1564–66. On quitting Paris he removed to Poitiers, where he was appointed regent of the College of St. Marceon, although then only twenty-one years of age. He next went to Geneva, where he filled the chair of humanity (Latin), and in 1574 he returned to his native country. Three months after his return he was appointed by the General Assembly of the Church of Scotland Principal of Glasgow University; and in 1580 he was transferred to St. Andrews to fill the same office there. At both places he distinguished himself by the services which he rendered to the cause of education, as well as by his singular intrepidity in maintaining the independence of the church against the regent, and even against King James himself. In 1582 he took the lead in framing a remonstrance against the absolute authority which the court was assuming in ecclesiastical affairs, and this remonstrance he presented to the king in person. By this proceeding he brought upon himself the resentment of the king's favourite, the Earl of Arran; and it was probably due to this that two years after he was summoned before the privy-council on a charge of high treason, founded on some expressions he was alleged to have made use of in the pulpit. His accusers failed to establish the charge laid against him, but condemned him to imprisonment for irreverent behaviour before the council. Before this sentence could be executed he managed to escape to England, where he remained till the disgrace of the favourite Arran. In Nov. 1585 he returned to Scotland, and in March, 1586, resumed his duties at St. Andrews. In 1587 he was moderator of the General Assembly, an honour again conferred on him in 1589 and 1594. In 1590 he was chosen rector of St. Andrews University, and he continued to hold this office by re-election for many years. In 1595 he rose greatly in the favour of King James by an ode which he composed, under the title of Stephaniskion, in celebration of the coronation of the queen; but this position he lost again in the following year by his boldness in presenting another remonstrance to the king. In 1606, after the accession of King James to the throne of England, Melville was summoned by the king to repair to London on the pretence that the king wished to consult with him on ecclesiastical affairs. On this occasion he again addressed the king on several occasions with the same boldness that he had always used; and having at last greatly offended his sovereign by a contemptuous Latin epigram which he composed on a service in the royal chapel, which seemed to Melville to be made up of ceremonies as ridiculous as those of the Romish Church, he was found guilty of *scandalum magnatum* and placed in confinement. He was not released till Feb. 1611, when, at the intercession of the Duke de Bouillon, who wished to secure his services as professor in his university of Sedan in France, his sentence was commuted to that of banishment. The remainder of his life was almost entirely spent at Sedan in the fulfilment of the duties of the post he had gone thither to occupy.

MELVILLE ISLAND.—1. An island in the Polar Sea, one of the north Georgian group, between 74° and 76° 50′ N. lat., and 105° 40′ and 113° 40′ W. lon. It is surrounded with enormous masses of ice, and the only vegetation is moss. Captain Parry discovered it in 1819, and passed the winter of 1819–20 there; and in 1851 its south and south-west shores were explored by Lieutenant M'Clintock, and its south-east by Bradford in search of Sir J. Franklin. Its only inhabitant in winter is the white bear. See POLAR SEAS.——2. An island off the north coast of Australia, lat. 11° 30′ S.; lon. 131° E. Its area is about 1800 square miles. The north and west coasts are low, covered by dense woods, intersected by swamps. The surface of the more elevated ground in the interior is covered with small shining masses of iron-stone, having a metallic lustre. Among the forest trees several species of Eucalyptus are most abundant. It was supposed to be inhabited by fierce tribes of blacks, but an exploring party in 1882 found none.

MEMBRANE, a general term used in anatomy and physiology to indicate any soft tissue composed of definite structural elements, and which may enter into the composition of parts, or may line cavities or tracts. Membranes may be classified according to their structure or functions. Thus we may distinguish *secreting* and *non-secreting* membranes; or we may speak of *serous*, *mucous*, and *synovial* membranes; or more primarily we might speak of membranes as *cellular* if composed of definite cell-elements, and as *fibrous* if exhibiting fibrous tissue in their composition. The serous membranes, of which the *peritoneum* and *pleura*, lining the abdomen and chest respectively, may be taken as good examples, form shut or closed sacs; and consist firstly of fibro-cellular tissue supporting the blood-vessels, the upper surface of which bears a layer of *pavement* or *tesselated epithelial* cells; and secondly of a so-called structureless or primary *basement membrane*, interposed between the epithelial and the fibro-cellular layers. The serum, or special secretion of the serous membrane, is secreted by or transudes from the blood towards the basement membrane, which, together with the epithelial cells, may be regarded as the essential parts of a serous membrane. The *synovial* membrane closely resembles the serous form, and exists as a thin membrane lining the various joints, and covering the articular surfaces and the ligaments which connect them. The *synovial secretion* differs from the serous in being thicker and more viscid. Its obvious office is to lubricate the articular surfaces and to afford smooth play to the joints. *Mucous membranes* exhibit a more complicated structure than the serous sacs. They line those tracts or channels in the body which communicate externally—for example, the digestive, respiratory, and genito-urinary tracts—and are generally prolonged on the outer orifices of the body, as on the lips, anus, vulva, &c. In mucous membranes we recognize the same lower fibro-cellular layer, supporting the blood-vessels and lymphatics, that exists in the serous sacs. Above this the basement membrane exists; but the upper or epithelial layer of mucous membranes exhibits diversities in structure, and may be arranged so as to form several layers. Underlying the epithelial layer we find the *corium*, which corresponds to the under layer of the skin or *derma;* and this corium becomes continuous with the true skin at the openings of the body, as seen in the lips. The corium and basement membrane are in many cases merged together and identical. The lower layer of the membrane, besides giving support to vessels and lymphatics, contains glands formed by depressions or involutions of its substances, and these glands are lined by *gland* or *secreting cells*, which appear to be merely modifications of the epithelial cells of the membrane, and upon which devolves the function of

secreting either the simple and characteristic *mucous* secretion, or, as in the case of the intestines, stomach, &c., fluids of a more specific nature. The process of secretion will be hereafter considered (see SECRETION), but the relation between membranes and secretion may be borne in mind; a slight complexity of structure thus placing an otherwise simple membrane in the category of secreting bodies, and investing them with powers and actions more or less complicated and intricate.

MEMEL, a town and seaport in Prussia, in the government of Königsberg, at the north end of the Kurisches Haff, where the Dange falls into the Baltic, 75 miles north-east of Königsberg. It is defended by a citadel, and is divided into three quarters—the old, the new, and Frederick's Town; with three suburbs. It is the seat of an admiralty and several provincial courts. Its manufactures consist of woollen and sail cloth, candles, soap, amber wares, &c. Iron-founding, distilling, brewing, and ship-building are also carried on, but the great source of its prosperity is its trade, which is very extensive, and consists chiefly of timber, corn, flax, hemp, potash, linseed, and colonial produce. In 1882 the value of the imports by sea was £420,038; of those by land and river, £872,061; total, £1,292,099; the value of the exports by sea was £868,135; of those by land and river, £255,021; total, £1,123,156. In that year the value of the export of timber alone amounted to £529,215. The timber and other exports are mainly the produce of the neighbouring portions of the Russian Empire. The port is difficult to approach in stormy weather, but the harbour is excellent and is rarely closed by ice, and only for a few days at a time. It is provided with a lighthouse, which stands 98 feet above the sea. Pop. in 1880, 19,660.

MEMMINGEN, a town in Bavaria, in the circle of Suabia, on the Aach, 41 miles south-west of Augsburg. Its manufactures are cottons, woollens, fustian, linen, hosiery, wax-cloth, leather, tobacco, sugar, glue, gunpowder, oil, &c. There is also an iron and bell foundry. There is a trade in corn and hops, besides the articles manufactured in the town. In 1286 Memmingen received from the Emperor Rudolf the privileges of a free town, which it maintained till 1802, when it fell to the crown of Bavaria. Pop. (1880), 8406.

MEMNON, the hero of a well-known Greek legend, in Homer mentioned as the beautiful son of Eōs (the morning), and in the post-Homeric accounts described further as an Æthiopian priest, the son of Tithonus and nephew of Priam, whom he assisted at the siege of Troy. He slew Antilochus, but was himself slain by Achilles. His mother was filled with grief at his death. Every morning she wept his fate, and the tears she shed are the dew-drops of the morning. From his ashes Zeus caused a flock of birds to arise, which fought over his funeral pile till half of them fell down dead on the ashes of the hero, thus forming a funeral sacrifice for him. These birds were hence called Memnones or Memnonides, and according to one story revisited the tomb of Memnon, and renewed their contest over it every year. In order still further to soothe the grief of Eōs, Zeus made her son immortal. Several large structures in Asia and Egypt had their origin imputed to this Memnon, and were hence called Memnonia. From Æthiopia, according to the account given by Pausanias, Memnon is said to have gone first to Egypt and then to Susa. Susa was said to have been founded by Tithonus, the father of Memnon, and the citadel by Memnon himself, whence it was called Memnoneion. In Egypt the whole of the western part of Thebes was called by the Greeks Memnoneia, and there was also a large structure to which the name of Memnoneion was given, at Abydos, in Upper Egypt. Strabo adds, that 'if, as is asserted, Memnon is called Ismandes by the Egyptians, the labyrinth also would be a Memnoneion.' In Thebes the Greek legend (but not till a comparatively late period) went further, and ascribed to Memnon a statue found in the Memnoneion. In front of a temple of King Amenophis III., who reigned about 1500 B.C., towards the end of the eighteenth dynasty, two sitting monolithic colossal statues of this king had been erected. The stone of which the statues are made is a silicious conglomerate of an extremely hard and brittle nature. The consequence of this was that daily, especially at the sudden change of temperature occasioned by the rising of the sun, smaller or larger fragments of the stone cracked off, so that the surfaces of both statues are all pitted over with cavities, some deeper and some shallower. It appears that the northernmost of the two statues must in this way at some time or other have received a crack through its whole breadth, causing the upper part of it to be thrown down when, in 27 B.C., an earthquake took place at the place where it stood. From this time tremulous tones, compared to the breaking of a chord of a musical instrument, were frequently heard to proceed at sunrise from the statue. These sounds, it is said, were caused by the small fragments flying off from the surface of the statue, and especially from that surface which became exposed after its fall, as the position of that surface seemed to produce a greater degree of resonance. Whether this be the correct explanation of the fact or not, it is only from the date mentioned that we find mention made of this singular phenomenon in ancient writers and in the inscriptions on the statue itself. It is at least the case that it is no uncommon thing in the desert and in the midst of extensive ruins in Egypt, to meet with stones which are liable to be ruptured in the manner described, and which emit a ringing sound when this occurs; and the stone which is most liable to this is that very silicious conglomerate of which the Memnon statue is made. The inscriptions on this statue begin with the reign of Nero, and reach down to that of Septimius Severus. They are written in Greek and Latin, and were inscribed by visitors who came to see and hear the statue. The restoration of the statue was probably due to Severus, and to judge from the inscriptions it would appear that the clear tones were no longer heard to proceed from it. Although this statue was called by the Greeks a statue of Memnon, it is evident from the fact that both upon it and upon the other the name and titles of King Amenophis III. are found inscribed on the plinths behind, that both statues were intended to represent that king. Both statues are still to be seen. The height of each of these statues seems to have been originally about 60 feet, or including the decorations which once crowned the heads, 70 feet. The Arabs call both statues together the Sanamāt, that is, the idols, and separately, Shama and Tama, whence the sobriquets by which they are commonly known of Shammy and Tammy. The so-called statue of Memnon in the British Museum is of course different from both of these.

MEMORY, that mental faculty by which impressions made upon the mind are retained and reproduced. Memory is so prominent a faculty of the human mind, so necessary, both in the most common transactions and the highest pursuits of life, so curious in its phenomena and at times so capricious, that it formed, even at a very early period, a subject of philosophical research; and to a certain degree more is known about it than about any other faculty, but beyond this point it is as incomprehensible as the other powers. It is easy to talk of the

memory in metaphors, to speak of impressions on the mind, store-house of ideas, recalling ideas, &c.; but what is this impression? where is it made? and what does the word signify, as applied to the mind? It is only a metaphor taken from the physical world to illustrate an act of the mind, which we can only represent figuratively, and reasoning on this assumption is but a *petitio principii*. Without memory the whole animal world would be reduced to a kind of vegetative life, such as we observe in the lowest classes of animals, because any variety of action presupposes memory. Memory embraces all ideas received from the senses, as well as those of an abstract character; all feelings and emotions. The power of memory, in regard to ideas received from the senses, appears to be strongest in regard to the sense of sight. We are able to remember a temple, a picture, a landscape, a face, with great clearness and truth. The ideas of sounds are, also, very strongly retained, the memory of them being more perfect in proportion as the sense of hearing is more nice. Music may be remembered very distinctly. It is not so with the three other senses, smell, feeling, and taste. The ideas received through these senses, it would appear, cannot be remembered with the same liveliness. It is difficult to recall, with much distinctness, the pain of a wound; we usually retain little more than the general idea of suffering.[1] So particular tastes are not easily recalled. Exercise, indeed, may give the memory considerable power even over these ideas. The taste of his favourite dishes dwells in the mind of the gourmand, and without making pretensions to *gourmandise*, a man may remember, with some distinctness, the flavour of a canvas-back duck. The impressions of smell are still more difficult to be recalled. Still, however, though the unaided memory does not easily recall ideas received from the senses, yet when external means of comparison are presented, they are immediately revived. If we smell a flower in this spring, we recollect at once distinctly the smell of the same in the last spring, and are in no danger of confounding flowers of different kinds. So with taste. Another circumstance worthy of remark is, that old people lose their memory for recent events, but retain a lively impression of the events of their earlier years, which shows how much remembrance is influenced by the liveliness of the original impression. It is remarkable, also, how some people, in consequence of diseases, mostly nervous fevers and apoplexies, lose the memory of everything which happened before their sickness, as if it were erased from the Platonic tablet. Instances have been recorded in which some sudden and violent derangement of the system has produced a state in which a person would remember everything which happened the day before yesterday, &c., but nothing which happened yesterday, &c. The next day, the relative periods of memory and forgetfulness continuing the same, he would remember what the day before he had forgotten.

Sir William Hamilton discusses the memory in the wider and popular sense of the term, as consisting of at least two separate faculties—the conservative faculty, by which impressions once made on the mind are retained, and which he regards as memory proper; and the reproductive faculty, by which such impressions are recalled. There is a third faculty intimately connected with these two, which he calls the representative faculty, and is that by which impressions, after being revived, are retained and vividly held up before the mind; but as he considers this to be more peculiarly the faculty of imagination it does not fall to be considered here. All these faculties are mutually dependent on one another. It would be impossible to ascribe any conservative or retentive faculty to the mind unless we could bring back mentally some of our previous mental impressions, that is, unless there were some faculty of reproduction; and there could be no reproduction if the mind had not the faculty of conserving past impressions as well as that of holding up before itself for a longer or shorter period the past impressions that were mentally reproduced. But although so closely connected with one another these faculties are none the less distinct, and with reference to the two faculties which constitute memory in the general sense of the word, it is worthy of remark that although neither can exist without the other, yet the two may exist in very different degrees in the same mind. A person may have a very good conservative faculty, that is, he may be able to retain in his mind a very large array of facts and impressions, without having the power of recalling with ease and readiness the knowledge that he retains, which constitutes the excellence of the reproductive faculty. It is this difference which at least partially explains the fact that a man of great scholarship and even of active habits of thought, may have little power of communicating his knowledge and ideas to others, and may be far surpassed in readiness of speech by a man of greatly inferior attainments and powers of mind; for to be a ready speaker it is not so necessary that a man's mind should be richly stored, as that his memory should be quick, easily stirred by slight associations, and prompt in reproducing what his mind retains.

Reference has been made in the previous sentence to associations as determining the operation of the reproductive faculty, and it is a fact which can scarcely escape the observation of any one, that its operation is so determined, that the memory does not act altogether at random. Many psychologists have attempted, with more or less success, to ascertain the laws of this determination. To these laws the name of laws of association of ideas is given, although the laws do not apply exclusively to ideas, but equally to cognitions, feelings, volitions, and even muscular movements; and states of mind or body coming under any one of these heads may be associated with others coming under any of the others as well as with others coming under the same head, so that cognitions may be associated with feelings as well as with other cognitions, and muscular movements with cognitions and feelings as well as with other muscular movements. To a pianist the sight of a note on a stave is associated both with the note on the piano which is represented by it, and with the muscular movement necessary to strike that note. In the mind of a railway signalman the sight of a passing train is associated with the action requisite to raise the proper signal to indicate that the train has passed. The laws of association sometimes act altogether involuntarily, and sometimes in partial dependence on the will, as when we know that one thing has previously been associated in the mind with something else, the name of a mountain, for example, with its height, and endeavour to renew the suspended association. Our endeavour cannot determine the exact moment at which the association shall be renewed, or even whether it shall ever be renewed, but it makes the renewal more likely than it would have been without such effort of will. When the reproduction of a mental state is wholly involuntary, Sir W. Hamilton calls it suggestion; when it is partly voluntary, reminiscence.

Aristotle is the earliest philosopher who is known

[1] Pain, indeed, when associated with the nobler senses, may be retained with considerable distinctness, as the discords which offend a musical ear, or the sharp grating of a hard-pointed slate-pencil on a slate, which offends every ear.

ciating the figures with certain letters of the words or sentences committed to memory. A system of this nature is propounded in Gray's Memoria Technica. A table must be drawn up like the following:—

a	*e*	*i*	*o*	*u*	*au*	*oi*	*ei*	*ou*	*y*
1	2	3	4	5	6	7	8	9	0
b	*d*	*t*	*f*	*l*	*s*	*p*	*k*	*n*	*x*

We may use either *u* or *l* to represent 5, either *y* or *x* to represent 0, and so on; and if we wish to impress on our memory that Julius Cæsar arrived at the supreme power in the year 46 B.C., we may change Julius into *Julios*, which will be easily remembered whenever we think of Julius, while the *os* of *Julios* will give us the date we wish to remember, 46. So also if we wish to remember 538 B.C. as the date of the fall of Babylon we may change Babylon into *Babylik*, the last three letters of which give us by the table the year mentioned. Another system with this object in view was perfected about the beginning of the present century by a German named Gregory von Fainaigle. Instead of modifying words in the manner suggested by Gray, he proposed to invent new words, some of the letters of which should correspond to figures according to a table similar to Gray's, while the others were used without any meaning merely to make up the word. In his system there was but one letter to each figure; the remaining letters of the alphabet were said to be *dumb*. Somewhat later a similar system was devised by a Dane called Karl Otto, and commonly known as Reventlow; and quite recently Mackay, in Great Britain, has applied a system in which sentences are used instead of words as the mnemonic vehicles for figures, to a considerable body of facts derived from history and science, to remember which involves the remembering of dates or numbers. The initial letters of the important words in the mnemonic sentences correspond in the order in which the words stand to the figures to be remembered, according to a table prefixed to the work. The mnemonic sentences there given are not only intended to help the memory in retaining the dates or numbers, but are also usually connected in some way with the fact to be remembered along with the date.

A peculiar system of mnemonics was invented during the present century by the Pole Jagwinski, who constructed mnemonic squares, to which and to the combinations of which he attached certain images. A society was started for the purpose of spreading the system, which was for some time largely used in educational institutions. The system was improved by the Polish General Bem. A Bohemian named Eduard Pick, who has repeatedly lectured on mnemonics in this country, lays particular stress upon the importance of applying the principles of mental association in arranging lists of words that have to be committed to memory, as in learning a foreign language. Before learning by heart any such list he would have the words arranged in such a manner that each may suggest the next following by some association either of likeness or of contrast, or some association of contiguity beyond what was involved in the accidental collocation of the words; and when no such relation exists between certain pairs of words he would interpose such words as are adapted to establish it. Thus a person committing to memory the irregular verbs of the second conjugation in French might associate *assaillir*, to attack, with *ferir*, to strike; *ferir* with *courir*, to run; *courir* with *fuir*, to fly; *fuir* with *surgir*, to rise; *surgir* with *fleurir*, to flourish; *fleurir* with *faillir* and *défaillir*, to fail; these with *mourir*, to die; *mourir* with *dormir*, to sleep, and so on. If it were found impossible to continue this chain by finding another verb belonging to the same class which might be readily suggested by *dormir*, we may continue the chain by introducing some links not derived from the list which we wish to commit to memory. Thus with the idea of sleeping (*dormir*) we might connect the idea of powerlessness, whence we come naturally by contrast to the idea expressed by *tenir*, to hold, as holding implies the exercise of power; from that we come to *acquerir*, to acquire, and so the chain may be continued anew from the list which is being committed to memory. Such an arrangement as this will unquestionably be of considerable assistance to the memory; but the method is somewhat cumbrous, and the advantage derived from the re-arrangement will sometimes scarcely compensate the time and trouble expended in making it. But it may be mentioned that it will often be found an easy matter, especially in learning by heart lists of nouns, to establish an arbitrary but firm association between the words as they stand by means of a pictorial image or succession of such images, in which they are all represented. Thus if we wished to learn by heart the German masculine nouns that form their plural by adding *er*, viz. *Boswicht*, a villain; *Gott*, God; *Geist*, a spirit; *Irrthum*, an error; *Leib*, the body; *Mann*, a man; *Rand*, an edge; *Reichthum*, riches; *Vormund*, a guardian; and *Wald*, a wood: we might connect all these together in our mind by supposing a child who had wandered in a wood from its guardian to have come upon a villain burying a stolen treasure at the margin of the wood close to the image of some heathen deity. This picture or imaginary incident is easily retained in the memory, and contains something to suggest to the mind every one of the words which we wish to retain in our memory. The wandering in the wood suggests *Irrthum*, error, and *Vormund*, guardian; the sight of the villain suggests *Boswicht* and *Mann*, which naturally brings up with it *Leib*, body; the action of the villain burying treasure suggests *Reichthum*, riches; the spot where the action is performed, the edge of a wood, in the presence of the statue of a deity, suggests *Rand*, *Wald*, and *Gott*, and *Gott* readily brings along with it *Geist*. By a succession of such imaginary incidents it will be found possible, and indeed by no means difficult, to form a firm connection between a very large number of words which have no natural connection. The images may often be sufficiently grotesque, but that will not prevent them from serving their purpose.

The following may be mentioned as among the most important works on mnemonics which have appeared within the present century: Kastner's Mnemonik oder System der Gedachtnisskunst der Alten (Leipzig, 1804); Freiherr von Aretin's Systematische Anleitung zur Theorie und Praxis der Mnemonik (1810); The New Art of Memory, by Gregory von Fainaigle (London, 1812); Principes et applications diverses de la mnémotechnie, by Aimé Paris (seventh edition, Paris, 1833); Traité de mnémotechnie (fifth edition, Bordeaux, 1835); Dictionnaire mnémonique, by the Portuguese brothers Castillo; Karl Otto's Lehrbuch der Mnemotechnik (Stuttgart, 1843), and Wörterbuch der Mnemotechnik (Stuttgart, 1844); also Pick on Memory; and Mackay's Facts and Dates.

MEMPHIS, an ancient city of Egypt, whose very situation has been a subject of learned dispute. According to Herodotus its foundation was ascribed to Menes, the first king of Egypt. It was a large, rich, and splendid city, and the second capital of Egypt. After the fall of Thebes it became the sole capital. Among its buildings, several temples (for instance, those of Phtha, Osiris, Serapis, &c.) and palaces were remarkable. At the time of the conquest of Egypt by Cambyses (524 B.C.) it was the chief commercial

centre of the country, and was connected by canals with the Lakes of Mœris and Mareotis. With the rise of Alexandria the importance of Thebes declined, and it was finally destroyed by the Arabs in the seventh century. In Strabo's time (A.D. 20) it was, in population and size, next to Alexandria. Edrisi, in the twelfth century, describes its remains as extant in his time. 'Notwithstanding the vast extent of this city,' says he, 'the remote period at which it was built, the attempts made by various nations to destroy it, and to obliterate every trace of it by removing the materials of which it was built, combined with the decay of 4000 years,—there are yet found in it works so wonderful as to confound the reflecting, and such as the most eloquent could not describe.' Among the works specified by him are a monolithic temple of granite 13½ feet high, 12 long, and 7 broad, entirely covered within and without with inscriptions, and statues of great beauty and dimensions, one of which was 45 feet high, of a single block of red granite. These ruins then extended about 9 miles in every direction, but the destruction has since been so great that although Pococke and Bruce fixed upon the village of Metrahenny (Moniet-Rabinet) as the site it was not accurately ascertained until the French expedition to Egypt, when the discoveries of numerous heaps of rubbish, of blocks of granite covered with hieroglyphics and sculpture, and of colossal fragments scattered over a space 3 leagues in circumference, seem to have decided the point.

MEMPHIS, a town and port of entry in the United States, in the state of Tennessee, in Shelby county, on the Mississippi, just below the junction of Wolf River, 209 miles W.S.W. of Nashville. It stands upon a bluff about 30 feet above the river in its highest floods, and is fronted by a fine esplanade. The town has been repeatedly devastated by yellow fever (last occasion 1879), which for a time checked its remarkably rapid increase. This rapid growth is due to its favourable position for trade, the Mississippi being deep enough from Memphis to its mouth to float the largest war-ship. The trade of the town is chiefly in cotton. Pop. (1880), 33,592.

MÉNAGE, GILLES, a distinguished man of letters of the seventeenth century, was born, August 15, 1613, at Angers, in which city his father was king's advocate. After finishing his early studies with great reputation he was admitted an advocate, and pursued his occupation for some time at Paris, but, disgusted with that profession, he entered the church, and through the favour of Cardinal de Retz and Mazarin obtained several benefices. From this time he dedicated himself solely to literary pursuits, and soon made himself known by his wit and erudition. He subsequently took apartments in the cloister of Notre Dame, and held weekly assemblies of the learned, where a prodigious memory rendered his conversation entertaining, although pedantic. These assemblies were called, from the day on which they were held (Wednesday, Mercredi), *Mercuriales*. He was, however, overbearing and opinionative, and passed his life in the midst of petty hostilities. He precluded himself from being chosen to the French Academy by a witty satire, entitled Requête des Dictionnaires, directed against the Dictionary of the Academy. He died in Paris in 1692 at the age of seventy-nine. His principal works are Dictionnaire étymologique, ou Origines de la Langue Française (a work interesting as being the first work of the kind in French, but written at a time when it was not considered ridiculous to derive *rat* from the Latin *mus*, on the ground that one must first have said *mus*, then *muratus*, then *ratus*, and lastly *rat*); Origines de la Langue Italienne; Miscellanea, a collection of pieces in prose and verse; an edition of Diogenes Laertius, with valuable notes; Remarques sur la Langue Française; Historia Mulierum Philosophorum; Poésies. After his death a Ménagiana was compiled from notes of his conversation, anecdotes, remarks, &c., which is one of the most lively works of the kind.

MENAI STRAIT and BRIDGE. Menai Strait is a strait about ¼ mile across, between the island of Anglesea and the coast of Wales. For an account of the celebrated bridges over this strait see BRIDGE (TUBULAR).

MENANDER, the most celebrated of the Greek writers of the new comedy, born at Athens, 324 B.C.; died there, B.C. 291. He was the pupil of Theophrastus, the Aristotelian philosopher, and an intimate friend of Epicurus. The superior excellence of the comedies of Menander, the number of which exceeded 100, has acquired him the title of *prince of the new comedy*, although in his own day he was not so much esteemed as his rival Philemon, who owed his success to his pandering to the popular taste for coarse jesting in preference to fine delineations of character. Of Menander's hundred comedies only eight gained the prize. We have, unfortunately, nothing but a few fragments remaining of them. Terence imitated and translated him, and from his comedies we may form some idea of the character of those of Menander. The best edition of the fragments of Menander is in Meineke's Fragmenta Comicorum Græcorum (Berlin, 1841). See DRAMA and GREECE—Literature.

MENASSEH BEN JOSEPH BEN ISRAEL, a celebrated rabbi, was born in Portugal, about 1604. His father was a rich merchant, who, suffering greatly both in property and person from the Inquisition, fled into Holland. At the age of eighteen the son was made preacher and expounder of the Talmud at Amsterdam. Having become poor through the confiscation of his father's property he engaged in commerce while still continuing his intellectual pursuits. He founded a printing-press, from which proceeded good editions of several authors. In 1632 he published, in the Spanish language, the first part of his work entitled Conciliador, &c., of which, the next year, a Latin version was printed by Dionysius Vossius, entitled Conciliator, sive de Convenientia Locorum S. Scripturæ quæ puguare inter se videntur, Opus ex vetustis et recentioribus omnibus Rabbinis magna Industria ac Fide congestum. He also published three editions of the Hebrew Bible. In the time of Cromwell he went to England, and obtained for his nation more privileges than they ever before enjoyed there. He died at Amsterdam in 1659. Among his other works are the Talmud Corrected, with notes; De Resurrectione Mortuorum; Esperanza de Israel, dedicated to the Parliament of England, in 1650, one object of which is to prove that the ten tribes are settled in America; and an Apology for the Jews, in the English language.

MENDELSSOHN, MOSES, a celebrated Jewish philosopher, was born, September 12, 1729, at Dessau, in Germany, and died at Berlin, January 4, 1786. His father, Mendel, a schoolmaster, though very poor, gave him a careful education. The first part of his life was passed in poor circumstances. When his father was unable to support him he wandered to Berlin, where he lived several years on the charity of some persons of his own religion, assiduously devoting himself all the time to study, chiefly in Hebrew and Hebrew literature, but also in mathematics and modern languages. At last, in 1750, he was appointed by a silk manufacturer named Bernhard, a Jew belonging to the same tribe with himself, tutor of his children. At a later period he took him as a partner in his business. In 1754 he became acquainted with Lessing, with whom he contracted a close intimacy, which had a great influence on his mind.

Intellectual philosophy now became his chief study. His Briefe über die Empfindungen were the first-fruit of his labours in this branch. He also became acquainted with Nicolai and Abbt, and his correspondence with the latter is a fine monument of the friendship and familiarity which existed between these two distinguished men. Mendelssohn contributed to several of the first periodicals, and now and then appeared before the public with philosophical works, which acquired him fame, not only in Germany, but also in foreign countries. The most celebrated of these is his Phædon, a treatise on the immortality of the soul, which was first published in 1767, but since that time has gone through numerous editions, and has been translated into most European languages. The title of the work is taken from Plato's dialogue on the same subject. He established no new system, but was, nevertheless, one of the most profound and patient thinkers of his age, and the excellence of his character was enhanced by his modesty, uprightness, and amiable disposition. His disinterestedness was without limits, and his beneficence ever ready as far as his small means would allow. He knew how to elude with delicacy the zealous efforts of Lavater to induce him to declare himself a Christian. To this encounter between Lavater and Mendelssohn German literature owes one of its greatest dramatic ornaments, Lessing's Nathan der Weise, in which the author, in the person of the hero, commemorates the virtues, the tolerant spirit, and comprehensive mind of his friend Mendelssohn. In his Jerusalem, oder über religiöse Macht und Judenthum, he gave to the world, in 1783, many excellent ideas, which were much misunderstood, partly because they attacked many deep-rooted prejudices of his race. In some morning lessons he had expounded to his son and other Jewish youths the elements of his philosophy, particularly the doctrine of God. He therefore gave the name of Morning Hours (Morgenstunden) to the work (published in 1785) containing the results of his investigations, of which his death prevented him from completing more than one volume. The last work of Mendelssohn was written in defence of his friend Lessing, of whom Jacobi had asserted that he was a Spinozist. It was entitled Moses Mendelssohn an die Freunde Lessing's, and was published in 1786, the year of Mendelssohn's death. The German language is indebted to him in part for its development. In the philosophical dialogue he made the first successful attempt among the writers of his country, taking for his models Plato and Xenophon.

MENDELSSOHN-BARTHOLDY, Felix, one of the most eminent composers of this century, born at Hamburg in 1809, was grandson of the celebrated philosopher Moses Mendelssohn. Placed in the most favourable external circumstances, his talent, which was remarkably precocious, had the advantage of excellent training. Zelter was his teacher in composition, and Louis Berger on the pianoforte. In his ninth year he played publicly in Berlin, and the following year in Paris, to which he had travelled with his parents. Even at that period he had composed many pieces of all kinds, in difficult forms. In 1825 he made a second journey to Paris with his father, who wished to consult the musicians there, and especially Cherubini, before finally determining to devote his son exclusively to music. The answer of all was a decided affirmative. Mendelssohn now devoted himself zealously to the study of music, not, however, to the neglect of other studies conducive to general cultivation. From 1827 to 1829 he attended the University of Berlin, where he studied chiefly history and geography. Meanwhile he had given many proofs of his ability as a composer. Before 1825 had appeared several quartettes for the piano, besides the opera called Die Hochzeit des Gamacho. The overture to the Midsummer Night's Dream, and his Meeresstille und glückliche Fahrt, which helped to found his fame, were produced during the years 1826–28. In 1829 Mendelssohn made his first professional journey to England. His reception at London was a brilliant one, and at Edinburgh and other places which he subsequently visited in England and Scotland he met with equal applause. After returning for a short time to Berlin he started in May, 1830, upon another tour through various parts of Germany and Italy, at the end of which he paid a visit of several months' duration to Paris, and a second visit to London. On his journey to Italy Mendelssohn had gone by way of Weimar, where he was very cordially received by the poet Goethe, then in his eighty-first year. After his second visit to London Mendelssohn returned to Berlin (June, 1832). The impressions made upon him during these two years of travel are noted in his interesting Reisebriefe (Leipzig, 1861: sixth edition, 1865). With reference to his musical productions also this period had not been unfruitful, for to it belong, besides various religious pieces, the first of the Lieder ohne Worte, the earliest form of the Walpurgisnacht, and the overture to the tale of the fair Melusine. In 1833 Mendelssohn went for the third time to London, and in the autumn of the same year became municipal music director at Düsseldorf, where he undertook, along with Immermann, to establish a theatre which should rest its claims solely on artistic grounds. It was not so successful as might have been expected, but was so far advantageous to Mendelssohn that it fixed his status in the musical world, and led to his employment in England, as well as in Germany, as a conductor of great musical festivals. After quitting his connection with Düsseldorf he was, in 1835, invited to Leipzig, to become director of the subscription concerts in the Gewandhaus. Here he succeeded so well that the Leipzig orchestra was regarded as the most complete in Germany. The first section of his stay at Leipzig reaches from 1835 to 1841. During these years he directed almost uninterruptedly the Gewandhaus concerts. He also completed his oratorio of St. Paul (first performed at Düsseldorf in 1836), and composed the Lobgesang (for the jubilee in celebration of the 400th anniversary of the invention of printing), and several pieces for the piano. He also acted as conductor of musical festivals on different occasions at various places at a distance from Leipzig, and among other places went twice to England. His fame continued to increase. In 1841 he received from the King of Saxony the title of chapel-master, and in the same year was invited by the King of Prussia to Berlin. Here he completed his music to the Antigone of Sophocles; but when he did not find a proper sphere of activity he returned in the beginning of 1842 to Leipzig to his old position. This second section of his stay at Leipzig extends to the winter of 1843. It is memorable for the production of his music to the Midsummer Night's Dream, and for the foundation of the musical conservatory at Leipzig, which was due to Mendelssohn's exertions. At the end of this second stay at Leipzig he accepted an invitation to become general director of church music at Berlin; but at the end of 1844 (during which year he had again visited England) he resigned the duties of this office, although he was still allowed to retain the title. He then retired for a time to Frankfort-on-the-Main, but in August, 1845, again appeared in Leipzig, where he completed the music to the Œdipus in Colonus of Sophocles, and that to Racine's Athalie in its second form. In 1846 he directed the music festival at Aix-la-Chapelle, and in part also the festival of vocal music at Cologne. He then went to Bir-

mingham, where, on the 25th of August, his Elijah was performed for the first time. After acting once more as conductor of the Gewandhaus concerts at Leipzig in the winter of 1846–47, and making one more visit to England, he passed the summer of 1847 partly at Baden-Baden and partly in Switzerland, and in September returned to Leipzig, where he died on the 4th of November, 1847. An opera called Lorelei and an oratorio called Christus were left unfinished at his death.

MENDICANT ORDERS. See ORDERS (RELIGIOUS).

MENDIP HILLS, a range of hills in England, which stretches for about 25 miles in a W.N.W. direction across the north of Somersetshire, with a mean breadth of 4 to 5 miles, and a height of about 1000 feet. It is partly inclosed and cultivated, but the far greater part forms a heathy sheep-walk. Mines of lead and calamine were once wrought in it to some extent, but have been almost abandoned.

MENDOZA, DON DIEGO HURTADO DE, a Spanish classic, distinguished likewise as a politician and a general, in the brilliant age of Charles V. He was descended from an ancient family, which had produced several eminent scholars and statesmen, and was born at Granada about 1503. His first political appointment was that of ambassador to Venice in 1538. In 1542 he was imperial plenipotentiary to the Council of Trent, and in 1547 ambassador to the court of Rome. As captain-general and governor of Siena he subjected that republic to the dominion of Cosmo de' Medici I., under Spanish supremacy, and crushed the Tuscan spirit of liberty. Hated by the Liberals, held in horror by Paul III., whom he was charged to humble in Rome itself, he ruled only by bloodshed; and although constantly threatened with the dagger of assassins, not only for his abuses of his power, but also on account of his love intrigues in Rome, he continued to govern until 1554, when he was recalled by Charles V. Amidst the schemes of arbitrary power Mendoza employed himself in literary labours, and particularly in the collection of Greek and Latin manuscripts. He sent learned men to examine the monastery of Mount Athos for this purpose, and took advantage of his influence at Soliman's court for the furtherance of the same object. After the abdication of Charles V. he was attached to the court of Philip II. An affair of gallantry involved him in a quarrel with a rival, who turned his dagger upon him. Don Diego threw him from the balcony of the palace into the street, and was in consequence thrown into prison, where he spent his time in writing love elegies. He was afterwards banished to Granada, where he observed the progress of the Moorish insurrection in the Alpujarras Mountains, and wrote the history of it. This work is considered one of the best historical writings in Spanish literature. He died at Valladolid in 1575. His library he bequeathed to the king, and it now forms one of the ornaments of the Escurial. His poetical epistles are the first classical models of the kind in the literature of his country. They are mostly imitations of Horace, written in an easy style and with much vigour, and show the man of the world. Some of them delineate domestic happiness and the tenderer feelings with so much truth that we can with difficulty believe them to be the work of the tyrant of Siena. His comic romance, written while he was yet a student, Vida de Lazarillo de Tormes (Tarragona, 1536; continued by De Luna, Saragossa, 1652), has been translated into several foreign languages; into English by D. Rowland (London, 1677). The first complete edition of his History of the War of Granada is in the edition of Mendoza's works, published at Valencia in 1776. On account of the view which it gives of the severity and tyranny of Philip's government of the Moors, by which they were driven to despair, the work was not allowed to be published at all till 1610, and then only in a mutilated form.

MENELAUS, son or grandson of Atreus, and brother of Agamemnon. From his father-in-law Tyndareus, whose daughter Helen he married, he received the Kingdom of Sparta or Lacedæmon. Paris, the son of Priam, king of Troy, having carried off his wife Helen with a part of his treasures, and some female slaves, and conveyed them to Troy, Menelaus, accompanied by Ulysses, went thither to demand the restitution of his wife and property, and this being refused, he summoned the Greek princes to revenge the affront according to their promise. He himself led sixty ships to Troy, and showed himself a brave warrior. In a single combat with Paris he was on the point of putting his rival to death, when the latter was carried off in a cloud by Aphroditē. In the story of the wooden horse Menelaus is mentioned as one of those who were inclosed in the inside. After the conquest of Troy Menelaus took Helen to return with her to his native land. Eight years he wandered before he reached home. He first went to Tenedos, then to Lesbos and Eubœa, but being tossed about by storms and tempests, he had to land in Cypria, Phœnicia, Egypt, and Libya, and was in several instances detained for a long time. On the Island of Pharos, on the Egyptian coast, he surprised Proteus asleep, by the aid of Eidothea his daughter, and compelled him to disclose the means which he must take to reach home. Proteus likewise informed him that he should not die, but would be translated alive into Elysium as a demigod and the husband of Helen.

MENES, according to Egyptian traditions, the first King of Egypt. Herodotus relates that he was the founder of Memphis, which he built on a piece of ground which he had recovered from the Nile by altering the river's course. According to Diodorus, Menes introduced into Egypt the worship of the gods, as well as a more elegant style of living. He has been identified by some with the Mizraim mentioned in Gen. x. 6. The name of Menes is found on inscriptions, but there are no contemporary monuments of him known.

MENGS, ANTON RAFAEL, one of the most distinguished artists of the eighteenth century, born at Aussig in Bohemia in 1728, was the son of an indifferent Danish artist who had settled in Dresden. From the sixth year of his age the young Rafael was compelled to exercise himself in drawing daily and hourly, and a few years later was instructed by his father in oil, miniature, and enamel painting. The father hardly allowed him a moment for play, set him tasks which he was required to accomplish within a given time, and severely punished him if he failed. In 1741 the young artist accompanied his father to Rome, and studied the remains of ancient statuary, the works of Michael Angelo in the Sistine chapel, and finally the inimitable productions of Raphael in the Vatican. He was left to pass the day there with bread and water, and in the evening his studies were examined with the greatest severity. In 1744 his father returned with him to Dresden, and Augustus soon after appointed him court-painter. A second visit to Rome was occupied in renewing his former studies, studying anatomy, &c. His first great compositions appeared in 1748, and met with universal admiration. A Holy Family was particularly admired, and the young peasant girl who served him as a model became his wife. On his return to Dresden the king appointed him principal court-painter. In 1751 he was engaged to paint the altar-

piece for the Catholic chapel, with leave to execute it in Rome. In 1754 he received the direction of the new academy of painting in the Capitol. In 1757 the Celestines employed him to paint the ceiling of the church of St. Eusebius, his first fresco. He soon after painted for Cardinal Albani the Parnassus in his villa, and executed various oil-paintings. In 1761 Charles III. invited Mengs to Spain, where his principal works at this time were an Assembly of the Gods and a Descent from the Cross. Returning to Rome, he executed a great allegorical fresco painting for the pope in the Camera de' Papiri, and after three years returned to Madrid (1773). At this time he executed the Apotheosis of Trajan in fresco, his finest work. In 1776 he returned once more to Rome, where he died in 1779. A splendid monument was erected to his memory by his friend the Cavalier d'Azara at the side of Raphael, and another by the Empress of Russia in St. Peter's. Mengs' composition and grouping is simple and noble; his drawing correct; his expression, in which Raphael was his model, and his colouring, in every respect are excellent. His works are finished with the greatest care. All that he wanted to be a great artist was originality. His writings in different languages (published in Italian and Spanish by Azara in 1780), particularly his Remarks on Correggio, Raphael, and Titian, are highly instructive. A translation into English was published at London in 1796. His friend, the celebrated Winckelmann, rendered him valuable assistance in the preparation of them.

MENINGES (Greek, *meningx*, a membrane), the specific name given to the three membranes which invest the brain and spinal marrow. The membrane immediately covering the brain and spinal cord is known as the *Pia mater*. This is a delicate vascular membrane, composed of connective tissue, supporting a thick net-work of blood-vessels, and dipping down between the folds of the brain substance, so as to insure its due nutrition. The middle layer is the *arachnoid*, and this is a serous membrane (see MEMBRANE) with its serous surface placed externally. Like all serous membranes, it consists of two layers, and is a closed sac or bag. It is attached to the pia mater over the brain, but invests the spinal marrow in loose folds. The third and outermost membrane is the *dura mater*, a strong fibrous membrane lining the interior of the skull, to which, in old age or through disease, it may become more or less adherent. Its inner surface is covered with epithelium, and is in contact with the parietal or outer layer of the arachnoid membrane, and it sends various prolongations inwards, which serve to support the brain.

MENINGITIS, the term applied to inflammation of the two inner membranes which envelop the brain — the *tunica arachnoidea* and the *pia mater*. (See MENINGES.) The most usual symptoms of this disease are violent headache, somnolence combined with sleeplessness, heat in the forehead, redness of the conjunctiva, pain in the ball of the eye, ringing in the ears, shivering followed by heat, &c. Delirium and sometimes convulsions mark a later stage of the disease; and increased somnolence, with paralysis of the eyes and difficulty in swallowing, and finally a state of profound coma, are the precursors of a fatal termination. When this disease occurs in children of a scrofulous and rickety habit of body, it is called acute hydrocephalus. (See DROPSY.) In children of a different habit of body it may be brought on by an attack of scarlatina, measles, or some other disease due to blood-poisoning; and in adults the disease may result from typhous and marsh poisons, from intemperance, mechanical injuries, and other causes. When meningitis has been brought on by mechanical injuries it may be moderated by bleeding, application of leeches to the temples, behind the ears, and to the nostrils; by cold applications on the head, and by strong revulsives applied to the lower extremities. In other cases no special treatment is of much avail.

MENIPPUS, a cynic philosopher, a native of Gadara in Palestine, supposed to have flourished about 60 B.C. He was originally a slave, but purchased his freedom. His writings were chiefly of a satirical kind. Lucian styles him 'the most snarling of cynics,' and in two or three of his dialogues introduces him as the vehicle of his own sarcasms. It appears that his satires were composed in prose, on which account those of Varro were denominated Menippean, and for the same reason that of Satire Ménippée was given in France to the celebrated piece written against the League and Philip II. of Spain, its head. Menippus is said to have hanged himself in consequence of being cheated of all the wealth he had acquired by his profession of usurer. None of his works are extant.

MENNO, SIMONIS (that is, the son of Simon), the founder of the Mennonites, born at Witmarsum in Friesland in 1496, or according to others in 1505. He was educated for the church, and became a Roman Catholic priest; but about 1530 the reading of the New Testament began to raise doubts in him as to some of the church dogmas, and in 1536 he dissolved his connection with the church. He then joined the Anabaptists. After the suppression of the disturbances at Münster Menno collected the scattered remnants of the sect, and organized societies, for which he secured the toleration of the government. His peregrinations for many years in Holland and the north of Germany, as far as Livonia, contributed to increase the number of his followers, and to disseminate his doctrines among those who were not satisfied with the progress of the Protestant churches in reform. Except in some opinions concerning the incarnation of Christ, to which he was probably led by the controversy concerning the bodily presence of Christ in the eucharist, and in the administration of baptism to adults only, his tenets agreed in general with those of the Calvinists. Menno died at Oldeslohe, in Holstein, 1561. See ANABAPTISTS.

MENOBRANCHUS, a genus of Amphibian vertebrates, included in the order Urodela of that class. These animals are Perennibranchiate amphibians, that is, they retain the gills of early life throughout their entire existence; these gills being associated with lungs, and the animal being thus, in the truest sense of the word, 'amphibious.' They are allied in structure to the Axolotls (which see) and to our ordinary Efts or Newts; these latter forms, however, not possessing gills in adult life. The Menobranchus is found in the lakes and fresh-water streams of North America, and is popularly known as the 'Great North American Eft.' The most familiar species is the *Menobranchus lateralis*, and this form frequently attains a length of 2 or even 3 feet.

MENOPOMA. The 'Giant Salamanders' (*Menopoma*) are found in North America and in Java, the Javanese species (*M. maxima*) averaging about 3 feet in length. These forms in adult life lose the gills with which, like all other Amphibians, they are provided in the earlier stages of existence; and they thus belong to the Caducibranchiate section of the order Urodela, in which they are included. The gill apertures, however, in the Menopoma do not, as in most other caducibranchiate forms, become closed after the disappearance of the gills, save in the Javanese species above-named. North America possesses several distinct species of these forms.

MENOTTI'S BATTERY. See GALVANIC BATTERY.

MENSTRUATION. This term, like that of *catamenia* (which see), is applied to the periodical discharge of blood from the generative organs of the human female, and which recurs at monthly intervals (Latin, *mensis*, a month; hence also the name *menses*, applied to the catamenial discharge). From abnormal causes the menstrual periods may recur at intervals exceeding four weeks, or they may occur at periods within the month. The phenomena of menstruation in woman are analogous to those of 'heat' or 'rutting' in the lower animals, such as the deer, sheep, &c. And in several of the higher Quadrumana a sanguineous discharge is observed to proceed from the genital organs at monthly periods. The essential part of menstruation is its connection with *ovulation* or the rupture of the ovisac and liberation of an ovule or egg from the ovaries, and its descent into the uterus. Indeed the discharge of blood itself is a mere *symptom* of ovulation. Hence the period when the human female is most liable to conceive is that limited to a few days before or a few days after menstruating.

MENSURATION, the practical determination of lengths, areas, and volumes. When certain lines in mathematical figures are known, the lengths of other lines and certain areas and volumes may be calculated by applying the rules of mensuration, which are exact or approximate deductions from mathematical principles. When lengths of lines are in feet, the areas found by the following rules are in square feet and the volumes in cubic feet. Inches, square inches, and cubic inches, or centimetres, square centimetres, and cubic centimetres, will suit the rules equally well.

Area of a triangle = the base multiplied by half the perpendicular from the vertex.

Area of a triangle when the lengths of the sides are known; from half the sum of the three sides subtract each side separately; multiply the half sum and the three remainders together, and extract the square-root of the product.

Area of any parallelogram = any side multiplied by the perpendicular distance from this side to the opposite.

Area of any rectilinear figure; divide it into triangles by straight lines which do not cut one another; find the area of each triangle, and add these areas for the answer.

Circumference of a circle = diameter multiplied by 3·14159.

Area of a circle = square of radius multiplied by 3·14159 = radius multiplied by half circumference.

Area of ellipse = semi-diameter major multiplied by semi-diameter minor and by 3·14159.

Volume of a cube = the cube of a side (if a is the side the volume is a^3 or $a \times a \times a$).

Volume of any rectangular figure = length, breadth, and depth multiplied together.

Volume of prism or cylinder = area of one end multiplied by the perpendicular distance between the ends.

Volume of pyramid or cone = area of base multiplied by one-third of the perpendicular from vertex to base.

Volume of sphere; multiply the cube of the radius by 3·14159, and add to the product one-third of itself for the answer.

Area of surface of sphere = four times the square of the radius multiplied by 3·14159.

Area of curved surface of cylinder = circumference of one end multiplied by nearest distance along the surface from one end to the other.

Area of curved surface of a right cone = half circumference of base multiplied by the slant height.

For the approximate determination of plane areas bounded by curved and straight lines see SURVEYING. The volumes of irregular solids bounded by plane faces may be determined by dividing them into prisms and pyramids. A column which is of a different diameter at different places may be divided into a great number of short columns, each of which may be supposed to be cylindric. The reader must be referred to special treatises for the methods of guaging employed in determining the volumes of casks, &c.

MENTAL DERANGEMENT. See INSANITY.

MENTCHIKOFF, ALEXANDER DANILOVICH, a Russian statesman and general, born near Moscow, in 1670, 1672, or 1674; died in Siberia in 1729. His father was a person of a very humble station of life, according to some a peasant, according to others a pastry-cook. His rise was due to his having, by his intelligent appearance, attracted the notice of General Lefort, who took him into his service, and introduced him to the notice of Peter the Great, who appointed him *denshchik* or side-de-camp. Having overheard the project of a conspiracy contrived by the body-guard of the Czar, he communicated his discovery to the Czar himself, and thus opened a way for himself to the highest honours. After the death of Lefort he took the place of that favourite, and from that time nothing was done by the Czar without previous consultation with him. But this position was not less due to his abilities than to his good fortune. He was equally great as a general and as a diplomatist, and rendered great service to his country by his patronage of art and science, of commerce and industry, and everything that tended to promote the well-being of the people. In 1706 he had the rank of a prince of the German Empire conferred on him by Leopold I., and a similar dignity was granted to him in Russia by Peter the Great in 1707; and in 1709, on the battle-field of Poltava, he received from his master the baton of a field-marshal. Yet his passion for money was the cause of many abuses, and he was three times subjected to a severe examination, and was once also condemned to a fine. The emperor punished him for smaller offences on the spot; but much of his selfishness and faithlessness was unknown to his sovereign. He became more powerful during the reign of Catharine I., who was raised to the throne chiefly through his influence. Yet his plan for having himself appointed Duke of Courland was not carried to a successful conclusion. When Peter II. succeeded her on the throne Mentchikoff grasped, with a bold and sure hand, the reins of government. In 1727, when his power was raised to the highest pitch, he was suddenly hurled from his elevation by the Dolgorukis, his possessions were confiscated, and he was banished to Siberia. He passed the rest of his life at Berezov. He bore his reverse of fortune at first with great resignation, and lived in such a frugal way that out of a daily allowance of ten roubles he saved enough to erect a small wooden church, on which he himself worked as a carpenter. But after the death of his wife and his eldest daughter, who had accompanied him into exile, he sunk into a deep melancholy.

MENTONE (French, *Menton*), a town in France, on the Mediterranean, in the department of Alpes-Maritimes, charmingly situated on a promontory which juts forward about the middle of a bay of 5 miles in circuit, overhung at certain points by precipitous cliffs and abruptly rising hills. The town is divided into two quite distinct parts, the old and the new. The former, situated on the sides of a steep hill, which was formerly surmounted by a strong castle, has preserved all its feudal aspect. The ancient walls are still standing, and the streets are dark and crooked. The whole nestles picturesquely in the

midst of a mass of verdure formed by olives, lemon-trees, orange-trees, and pines. The new part of the town stretches along the base of the hill on which the old part is situated, parallel to the sea. The climate of Mentone is as mild and equable as that of Cannes or Nice. Although a cold wind generally prevails about noon, it is very rarely that the thermometer descends as low as the freezing-point, or rises higher than 30° C. (86° Fahr.) Mentone has hence become a favourite resort for persons in delicate health. Numerous fine villas are scattered over the environs of the town. Beautiful pieces of furniture in the wood of the carob-tree, the olive, and the citron are made; and there are also manufactories of vermicelli, essence of lemon, &c. There is a considerable trade in fruit, in flowers and leaves used in the manufacture of perfumes, and in olive-oil. The town of Mentone belonged to the principality of Monaco from 1346 to 1860, but in the latter year was ceded to France. Pop. 11,000.

MENTOR, the faithful friend of Ulysses, who intrusted to him the care of his domestic affairs during his absence in the war against Troy. The education of the young Telemachus fell to his charge, and when the latter set out on his voyage in search of his father Minerva accompanied him under the form of Mentor (Odyssey, ii. 399; iii. 12, &c.), acting the part of a prudent and experienced counsellor to the young hero. This character of a sage adviser is more fully developed in the Télémaque of Fénelon, in which Mentor plays a conspicuous part. Mentor has thence acquired the metaphorical sense of a wise and faithful counsellor or monitor.

MENTZ. See MAINZ.

MENU. See MANU.

MENZALEH, or MENZALA, a large lake or lagoon in Egypt, running parallel with the Mediterranean, from which it is divided by a narrow slip of land, from 2 to 12 miles in breadth. It receives the Pelusiac and Tanitic branches of the Nile, and communicates with the sea by three openings called Dibeh, Gemileh, and Om Farejeh. The lake is of comparatively recent origin, and covers what was formerly a fruitful district of the delta, having arisen through neglect of the dams. Its waters are soft in the time of inundation, and become brackish as the river retreats within its channel. Numerous boats continually fish on the lake. Length of the lake from north-west to south-east, about 38 miles; breadth, about 20 miles. There is a small town of the same name on the south side of the lake, which carries on a trade in rice and fish. The Suez Canal passes through it near its eastern extremity.

MEPHISTOPHELES, a name for the devil, which has been rendered current by Goethe's Faust. Goethe derived it from an old popular legend, in which it is spelled *Mephistophiles* or *Mephistophilis*. In the English poet Marlow it is *Mephistophilos*, in Shakspere (Merry Wives of Windsor, act i. scene 1) and Suckling *Mephostophilus*, and in the old puppet-show *Mephistophles*. The etymologies of the word are as various as the spelling. Some suppose it to be an irregularly formed Greek compound from the negative *mē; phōs*, light; and *philos;* loving, thus signifying 'not loving the light.' Others surmise that it may be derived from the Latin *mephitis* and the Greek *philos*, in which case it will signify literally 'loving the mephitic vapours of hell.' Others again connect it with the Hebrew *mephir*, 'scatterer,' 'destroyer,' and *tophel* 'liar.' The Mephistopheles of Goethe has little in common with the devil of the popular imagination. He appears, especially in the original form of the drama of Faust, as a real man of flesh and blood, who only preserves those traits of the popular devil of the middle ages which are compatible with a true human individuality—as the companion of Faust, as a selfish and malevolent votary of pleasure, always looking to the real, and bringing back Faust by cold and heartless irony, from barren speculation to the enjoyment of the present life. He is hence often regarded as the Doppelganger of Faust, in whose breasts two souls reside, one of which always draws him down to the world and sensual enjoyment, while the other tends to raise him to the desire after some ideal good. In the second revised and altered form of the drama of Faust a metaphysical import is given to the character of Mephistopheles, which is not traceable in the original form.

MEPPEL, a town in Holland, in the province of Drenthe, 12 miles west by south of Hoogeveen, at the junction of the rivers Echtinger, Reest, and Havelter, continued by the Reest, navigable hence 6 miles south-west to the Zuider Zee. It has manufactures of various kinds of linen and cotton fabrics, including esteemed sailcloth, bleacheries, hat-factories, roperies, tan-works, boat-building yards, and tobacco and vinegar works, oil, saw, and corn mills, and breweries. It carries on a considerable traffic and transit trade, being the chief port and outlet for the products of the province. Pop. 8238.

MEQUINEZ, a city, Morocco, near the left bank of the Sebou, and 35 miles west of Fez, in a beautiful and well-watered plain. It occupies a great extent of space, the houses consisting of a ground floor only. The city is surrounded by a wall 6 feet high, which serves as a defence against the Berbers, who often make incursions even to its gates; and contains a handsome palace, built by Muley Ismael, who had resolved to make it the capital of his northern dominions. The emperors of Morocco still reside occasionally at Mequinez. The trade of the place is not of much importance. Pop. about 30,000.

MERCANTILE LAW. See COMMERCIAL LAW.

MERCANTILE MARINE FUND, a fund created by the Merchant Shipping Act, and composed of—1st, fees receivable by the board of trade in connection with engagement and discharge of seamen, the binding of apprentices, the examination of masters and mates, the survey of passenger steamers, and in general all fees payable to the board under the third and fourth parts of the act mentioned; 2d, all light dues; 3d, Trinity House rates; and 4th, fees receivable under a table relating to wreck and salvage. The fund is applied to the payment of salaries and expenses connected with the local marine boards and mercantile marine offices, the survey of steamers, the light-house service, the Trinity House service in the Thames, the maintenance of life-boats, to the payment of rewards for the preservation of life, and to the defraying of all expenses in connection with wrecks. For extraordinary expenses the treasury may, upon the application of the board of trade, advance a sum not exceeding at one time £200,000, to be a charge on this fund.

MERCANTILE MARINE OFFICES. See LOCAL MARINE BOARDS.

MERCATOR, GERARD, a mathematician and geographer, born at Rupelmonde, in Flanders, in 1512. He studied at Louvain, where his progress in mathematics was very rapid, and he soon became a lecturer on geography and astronomy, making his instruments with his own hands. Granvella, to whom he presented a terrestrial globe, recommended him to Charles V. Mercator entered into the emperor's service, and executed for him a celestial globe of crystal, and a terrestrial globe of wood. In 1552 he retired to Duisburg, and received the title of cosmographer to the Duke of Juliers. His last years were devoted to theological studies. He died in 1594. Mercator published a great number of maps and

charts, which he engraved and coloured himself. He is known as the inventor of a method of projection called by his name, in which the meridians and parallels of latitude cut each other at right angles, and are both represented by straight lines, which has the effect of enlarging the degrees of latitude as they recede from the equator. His first maps on this projection were published in 1569; the principles were first explained by Edward Wright, in 1599, in his Corrections of Errors in Navigation, whence the discovery has sometimes been attributed to him. His Tabulæ Geographicæ (Cologne, 1578) is the best edition of the maps of Ptolemy, and has been merely copied by his successors.

MERCATOR'S PROJECTION. See MAP.

MERCHANT SHIPPING ACTS, the act 17 and 18 Vict. cap. civ. (1854), together with the acts amending it, and construed along with it. The act of 1854 is an extremely long one, consisting of 548 sections, and divided into the following eleven parts:—i. relating to the board of trade and its functions in connection with the provisions of this act; ii. relating to the ownership, measurement, and registry of British ships; iii. containing the law with regard to masters and seamen; iv. prescribing the measures to be taken to secure the safety of ships with their cargoes and passengers; v. relating to pilotage; vi. to lighthouses; vii. to the mercantile marine fund; viii. to wrecks, casualties, and salvage; ix. to the liability of ship-owners; x. containing various provisions with regard to the general legal procedure in cases arising out of this act; xi. of a miscellaneous character. The act of 1855 contains amendments with regard to lighthouses, the ownership and registration of British ships, seamen in British vessels, wrecks, and one or two other matters. That of 1862 contains further amendments with regard to registration, and also with regard to steam-ships, pilotage, lighthouses, wrecks, the liability of ship-owners, and merchandise conveyed by sea. The act of 1867 relates to the measures to be taken for securing the health of seamen. The acts of 1871 and 1873 contain fresh amendments as to registration, the law of masters and seamen, and the means to be employed to ensure the safety of ships with their cargoes and passengers. The act of 1876 is wholly taken up with provisions intended to aid in securing the seaworthiness of ships in the state in which they are sent to sea. An act of 1880 amends the law relating to the payment of wages and rating of seamen; another passed in the same year regulates the carriage of grain; while a third limits the number of individuals entitled to be registered at the same time of any one ship. For particulars regarding the enactments of the Merchant Shipping Acts see BOARD OF TRADE, LIGHTHOUSES, LOCAL MARINE BOARDS, MASTER, MERCANTILE MARINE FUND, NAVAL COURTS, NAVIGATION, PILOT AND PILOTAGE, SHIP-OWNERS (LAW RELATING TO), SHIPS (REGISTRATION OF BRITISH), TRINITY HOUSE, and WRECKS.

MERCIA, the largest kingdom of the Saxon heptarchy, comprehended all the middle counties of England, and was founded by Crida in 585. Like the other Anglo-Saxon kingdoms it had a stormy history, being almost continually at wars with some of its neighbours. In 827 it was conquered by Egbert, who united the different kingdoms of England into one. After this time it was repeatedly overrun by the Danes. As its frontiers extended to those of the other six kingdoms, as well as to Wales, it derived its name from that circumstance (Anglo-Saxon *Merk*, marches). See ENGLAND—History.

MERCURY (connected etymologically with *merx*, merchandise, and *mercari*, to trade), the Roman god who presided over commerce and gain. As early as 495 B.C. a temple was built to him near the Circus Maximus; and another temple was built in later times near the Porta Capena by the side of a well on a site previously occupied by an altar of this divinity. A statue with a purse in its hands as symbolic of his office as a god, was erected to him in the *vicus sobrius*, where oblations of milk were offered to him. His festival was on the 25th of May, and celebrated principally by merchants, who sprinkled themselves and their merchandise with water from his well at the Porta Capena that they might obtain personal purification, and that their wares might bring them enhanced profit. Mercury was identified by the later Romans with the Greek Hermes, and to him were assigned the attributes and myths proper to the Greek divinity. See HERMES.

MERCURY, in astronomy, the planet nearest the sun. He moves round the sun in 87·9693 of our mean solar days, at a mean distance of 35,392,000 miles. The eccentricity of his orbit is 0·2056, the inclination of his orbit to the ecliptic is 7° 0′ 8″·2, both greater in Mercury than in any other planet; his diameter is about 3050 miles. He is so near the sun (his greatest possible elongation is 29°) that he can only be beheld under very unfavourable circumstances; the exactness of his period of axial rotation as given by astronomers (24 hours 5 minutes 28 seconds) may be doubted. He exhibits phases like the moon, and may be seen sometimes after sunset or before sunrise shining with a pale rosy hue. He is best seen in the spring at his greatest easterly elongation, when he is visible for an hour and three quarters after sunset, and at the corresponding westerly elongation in autumn. With a good telescope he can often be seen in the daytime. The transit of Mercury over the sun's disc is not so important as that of Venus, but it is of some interest to astronomers as affording a study of transit phenomena. Transits take place at intervals of 13, 7, 10, 3, 10, 3, &c., years.

MERCURY, a liquid metal, also called quicksilver, is included among those which have been known from time immemorial. Cinnabar or native sulphide of mercury is the great source from which the metal is obtained. The chief cinnabar mines are at Idria in Illyria, and at Almaden in Spain; in California, Peru, and Chile; in China and Japan; and in Hungary, Bohemia, and the Ural Mountains. Besides the sulphide there are also found the iodide, chloride, and sometimes the selenide of mercury. The metal sometimes occurs native, and at other places it is associated with silver or with gold. To obtain the metal the ore is broken up and heated in a peculiarly shaped apparatus, generally along with calcined lime or smithy scales, sometimes only with access of air. By this means the sulphur is removed (as calcium or iron sulphide, or as sulphur dioxide), and the mercury is vaporized and afterwards condensed by suitable arrangements. The uses of mercury, medicinal and other, are very numerous. It is employed, for instance, to separate gold and silver from their ores by the process of amalgamation; and is largely used in the silvering of mirrors, as also in barometers and thermometers, steam-gauges, &c.

Mercury at ordinary temperatures forms a coherent, very mobile liquid, having a specific gravity of 13·596 at 4° (Regnault); at −39° it becomes solid, forming tin-white ductile octahedra or needle-shaped crystals, which may be easily cut with a knife. Mercury boils at 357°·25 under a pressure of 760 mm. (Regnault); at ordinary temperatures, however, vapour is given off by this metal; hence the air in a work-room where mirrors are made always contains considerable quantities of mercurial vapour. To do away, in a measure, with the bad effects of this vapour

on the whole it has been proved to yield a small quantity of chlorine [illegible] by uniting with the mercury to form mercuric chloride, while the latter is only partially [illegible]. Mercury is acted on by nitric acid, [illegible] by chlorine and by aqua regia. The atomic weight of mercury is [illegible].

Mercury forms a great many alloys with other metals, which are generally called amalgams; in some instances these amalgams appear to form definite chemical compounds, but in almost every case the affinity subsisting between the mercury and the other metal is very slight. These amalgams may generally be formed by the direct combination of the two metals. The most important salts of mercury are the following:—

Mercurous chloride, $HgCl$	Mercuric iodide HgI_2
Mercurous oxide, Hg_2O	Mercuric cyanide $Hg(CN)_2$
Mercurous iodide, HgI	Mercuric sulphide, HgS
Mercurous sulphide, Hg_2S	Mercuric nitrate, $Hg(NO_3)_2$
Mercurous nitrate, $HgNO_3$	

Mercury also forms a large series of ammoniacal bases, and it also enters into combination with many organic radicles.

1. *Mercurous Chloride*, $HgCl$.—This compound has been long known under the various [illegible] it has been [illegible]. It is now commonly known as *calomel*. Under the name of *horn mercury* this body is found native in dimetric crystals, but it is more generally prepared artificially—sometimes in the dry way, by triturating four parts of corrosive sublimate or mercuric chloride with three parts of mercury; and sometimes in the wet way, by precipitating a warm dilute solution of mercurous nitrate by means of common salt, and washing the resulting precipitate with cold water. This salt forms a dirty white crystalline powder; the crystals assume dimetric forms; it is tasteless, inodorous, and insoluble in water. Calomel is much used in medicine, being often taken internally in pills as a purgative, and especially as an agent to remove bile from the system. *Blue pill*, which consists of metallic mercury, confection of roses, and liquorice worked into a pasty mass, has similar properties.

2. *Mercuric Chloride*, $HgCl_2$.—Like the preceding this compound has been distinguished by many names; that by which it is most generally known is *corrosive sublimate*. Mercuric chloride is produced by burning mercury in excess of chlorine gas. On the large scale it is usually manufactured by heating in a suitable vessel an intimate mixture of common salt and mercuric sulphate, whereby mercuric chloride is formed and sublimed, while sodium sulphate remains behind. To obviate the formation of mercurous chloride (from the action of mercurous sulphate, which is generally present) a small quantity of manganese dioxide is usually added to the mixture.

Mercuric chloride crystallizes in two forms, both belonging to the trimetric system. This salt vapourizes easily; even at ordinary temperatures it evolves vapours; it has a metallic taste, and is a very powerful acrid poison. It is soluble to a certain extent in water. By the action of several metals on mercuric chloride part or all of its chlorine is withdrawn, with the production of calomel or of metallic mercury.

3. *Mercurous Oxide* or *Black Oxide of Mercury* (Hg_2O) is a brownish-black powder which is precipitated on the addition of an excess of caustic alkali to the solution of a mercurous salt. This oxide is very unstable, being easily resolved into mercuric oxide and mercury.

4. *Mercuric Oxide*, or *Red Oxide of Mercury*, HgO.—This compound, which was known in the eighth century to the Arabians, may be prepared by boiling mercury for a long time in a flask filled with air, or by [illegible] the nitrate at a high temperature, or by precipitating the solution of a mercuric salt by means of [illegible]-ash. By precipitation a yellow-coloured salt is obtained, while that obtained by ignition is of a bright [illegible] colour. This salt mercuric oxide is interesting as being the compound from which Priestley in the year 1774 prepared oxygen for the first time. By concentrating the sun's rays by means of a lens Priestley effected the decomposition of this oxide into mercury and the hitherto unknown gas oxygen. Mercuric oxide has a repulsive taste, and is a powerful [illegible].

5. *Mercurous Iodide*, HgI; and 6. *Mercuric Iodide*, HgI_2.—The former salt, which is a greenish-yellow powder, may be prepared by triturating mercury with [illegible] by precipitating a mercurous salt with potassium iodide. The latter salt is best obtained by precipitating mercuric chloride with potassium iodide, whereby a splendid scarlet-coloured precipitate is produced; this precipitate dissolves easily in potassium iodide solution, and crystallizes therefrom in microscopical quadratic octahedra. When gently heated this red salt turns yellow, and sublimes in bright yellow rhombic prisms; when these yellow crystals are rubbed or pressed they instantly pass back to the red modification; the same change takes place slowly if the crystals are left to themselves.

7. *Mercurous Sulphide*, Hg_2S; and 8. *Mercuric Sulphide*, HgS.—The former is a black powder, produced by the action of sulphuretted hydrogen or ammonium sulphide on solution of mercurous salts; at a gentle heat it is decomposed into metallic mercury and mercuric sulphide; at a stronger heat it sublimes with formation of, first, metallic mercury, then mercuric sulphide. The salt mercuric sulphide (HgS) exists in two modifications, as black or amorphous sulphide and as crystallized or red sulphide; the latter modification is known by the names of *cinnabar* and *vermilion*.

a. Amorphous Mercuric Sulphide may be prepared by precipitating the solution of a mercuric salt by means of sulphuretted hydrogen or of ammonium sulphide, or by triturating together 100 parts of mercury with 16 parts of sulphur; the product thus obtained is called *Ethiop's mineral* in pharmacy.

β. Crystallized Mercuric Sulphide occurs native; it is also prepared artificially in many ways. The principle of these methods is that when five or six parts of mercury are added to one part of sulphur, and the temperature gradually raised, combination takes place between the two elements; and further, that when this product is broken up into pieces, mixed with a little sulphur, and subjected with proper precautions to a certain degree of heat, a sublimate of pure cinnabar is obtained. The details of the manufacture vary at different places; the Chinese cinnabar is generally esteemed as the best. The most important point in the manufacture to be attended to is the prevention of an admixture of amorphous sulphide with the crystalline sulphide.

9. *Mercurous nitrate*, $HgNO_3$; and 10. *Mercuric nitrate*, $Hg(NO_3)_2$.—The mercurous salt is formed by the prolonged action of moderately concentrated nitric acid upon mercury; it forms colourless monoclinic crystals containing one molecule of water of crystallization. Mercuric nitrate is produced in the form of a syrupy liquid by dissolving the corresponding oxide in nitric acid and evaporating the liquid at a gentle heat. By concentrating the solution, keeping it as neutral as possible, and cooling it to 15°, large colourless rhombic plates of the nitrate crystallize out with eight molecules of water. Various other nitrates of mercury are known.

When one part of mercury is dissolved in twelve parts of strong nitric acid, the solution when cold,

mixed with eleven parts of alcohol, and the whole heated in the water bath and allowed to stand for some time, a precipitate forms which, when collected and dried, exhibits peculiar properties. If this substance—called fulminating mercury ($C_2HgN_2O_2$)—be heated to 186° C., or if it be forcibly struck, it detonates with great violence—the explosive force being greater than that of gunpowder, but not so gradual. This substance, if used in a gun, is therefore more likely to burst the gun than to propel the ball to any great distance; it is, however, very suited for percussion caps, for which purpose large quantities of it are used.

MERGANSER (*Mergus*), a genus of natatorial or aquatic birds, belonging to the Anatidæ or Duck family, and distinguished as the sub-family Merginæ by the slender cylindrical bill, the upper mandible terminating in a strong hooked process or *unguis*. The lamellæ or plate-like processes which in the Ducks fringe the edges of the bill, and serve to strain the mud amidst which they grope for food, are exceedingly strong in the Mergansers, and present the appearance of rows of tooth-like processes. The Goosander (*Mergus merganser*) forms the typical British species; and the Hooded Merganser of North America (*M. cucullatus*) is also a familiar form, and has occasionally been met with in Britain. All the Mergansers are strong active birds. They feed chiefly upon fishes, and swim and dive after their prey with great ease and dexterity. They appear to inhabit the borders of lakes, but are also found on the sea-coasts. They are essentially northern in their distribution, and migrate southwards on the approach of the colder season, although several instances are on record where these birds have remained in Britain throughout the year. The nest is built of grass and roots, and is lined with 'down.' The female alone incubates, but the male watches near the nest. From eight to fourteen eggs are laid. They are gregarious in habits, and the young enter the water as soon as they are hatched.

MERGUI, a seaport town of British Burmah, on one of the mouths of the river Tenasserim. It is inclosed by a stockade of entire trees, forming a kind of wooden wall, pierced with brick gateways, and consists of wide streets and houses built on piles. The religious edifices are numerous, but with the exception of the large pagoda, paltry. The harbour is safe. The trade, mostly with China, includes exports of sappan wood, tortoise-shell, shark-fins, &c. Pop. 10,731.

MERGUI ARCHIPELAGO, a chain of islands in the Indian Ocean, off the coast of Tenasserim and Lower Siam, the more northern ones forming a part of the British province of Mergui. They are generally covered with trees, and have, most of them, small trickling rills of pure water. A few cultivated patches are here and there to be met with. The adjoining seas abound in fish and excellent oysters; pearls also, of good quality and lustre, are found along the shores of nearly all the islands. One of the chief articles of export are edible birds' nests, which are sold to the Chinese and Malays. The inhabitants are harmless and industrious, but few in number.

MERIAN, MARIA SIBYLLA, a daughter of Matthew Merian, a well-known engraver, was born at Frankfort in 1647. She studied under her step-father Morefels, and Mignon, and was distinguished by the taste, skill, and accuracy with which she painted flowers and insects in water colours. Her zeal for this department of painting induced her to make a voyage to Surinam for the purpose of observing the metamorphoses of the insects of that country; and after a residence of two years she returned with a large collection of drawings of insects, plants, and fruits on vellum. Her works are Erucarum Ortus, Alimentum, et Metamorphosis; History of the Insects of Europe; and Dissertatio de Generatione et Metamorphosibus Insectorum Surinamensium, with sixty plates. She died at Amsterdam, 1717. One of her daughters published a new edition of the last-named work, which her mother was preparing at the time of her death.

MERIDA (Latin, *Emerita Augusta*), a city of Spain, in Estremadura, in the province, and 30 miles east of Badajoz, on the right bank of the Guadiana, here spanned by a Roman bridge of eighty-one arches, 2575 feet long. In respect of stupendous and well-preserved monuments of antiquity Merida is the Rome of Spain. Besides the bridge above mentioned, which was built by Trajan, the principal Roman remains are a triumphal arch, 44 feet high, in honour of that emperor, and called the Arch of Santiago; the temple of Diana, now built into a dwelling-house, and in which are nineteen fluted granite columns, 40 feet high, with Corinthian capitals; the theatre, which is almost perfect; the amphitheatre or Naumachia; the circus, in good preservation; the great aqueduct, arched in three tiers, one of the grandest remains of antiquity; &c. Merida perhaps existed before the Roman conquest, but it was at least rebuilt by the legate Publius Carisius, in the year 23 B.C. Augustus here settled the veteran *emeriti*, of the fifth and tenth legions, who had served in Cantabria. The city became the capital of Lusitania, and continued in great splendour for several centuries. It capitulated in 715 to the Moors, from whom it was taken again by Alonzo el Sabio in 1229; and from that day the province and city date their decline, and now are poor and almost depopulated. Some of the arches of the bridge were destroyed in 1812 during the siege of Badajoz, in order to impede Marmont's advance to the relief. Pop. 4112.

MERIDA, or YUCATAN, one of the states of the Mexican Confederacy. See YUCATAN.

MERIDA, the capital of Yucatan, in Central America, about 25 miles from the port of Progreso, on the Mexican Gulf, with which it is connected by a railway opened in 1880. It has a Moorish aspect generally, having been built at a time when that style prevailed in Spanish architecture. The streets are named after a painted wooden figure of some animal or other object, placed in a conspicuous situation at one of the corners, as the Street of the Elephant, the Bull, Flamingo, &c. The city contains a number of fine squares, the principal of which, the Plaza Mayor, 600 feet square, stands in the centre. The square is bounded by the cathedral, bishop's palace, government-house, and private dwellings. The cathedral has a most imposing appearance, being surmounted by well-proportioned domes, pinnacles, and turrets, and having a series of lofty windows. Merida was founded in 1542. Pop. 32,000.

MERIDIAN, a plane of the heavens passing through the poles of the earth and the zenith of the observer, or the great circle (geographical meridian) in which the earth is cut by this plane; the meridian evidently cuts the celestial and terrestrial equators at right angles; it is noon to the observer when the sun is in the meridian. Geographical meridians are employed in reckoning longitude, which is the angle between the meridian of any place and the meridian which passes through Greenwich. The *meridian altitude* of a heavenly body is its altitude when on the meridian.

MÉRIMÉE, PROSPER, a distinguished littérateur, born at Paris on the 28th September, 1803. Having received an excellent education at the Collége Charlemagne he devoted himself to the study of the law, and passed advocate; but he attached himself to

literature in his twenty-second year under the *nom de plume* of Joseph Lestrange, and published what was professedly a translation from the Spanish, though really original. The title was Théâtre de Clara Gazul, Comédienne Espagnole, 1825, which contained eight prose comedies. Other works followed in rapid succession. After the revolution of July, 1830, he was appointed secretary to the ministers of commerce and marine. In 1831 he was made inspector of ancient monuments; in 1844 he was received at the French Academy; he was elevated to the senate in 1853; commander of the Legion of Honour, 1860; grand officer, 1866; and died at Cannes, 2d Oct. 1870. In addition to the work mentioned above he was the author of Guzla, 1827; Jacquerie, 1828; Mosaïque, 1833; Contes et Nouvelles, 1846; Histoire de Don Pèdre I., 1843; Monuments historiques, 1843; Les faux Demetrius, 1854.

MERINO, a woollen tissue, dyed various colours, and often also printed. In the better kinds of goods both the warp and the woof are of carded woollen yarn, but in inferior sorts the warp is of cotton. In this article the Saxons compete very successfully both with France and Great Britain. Another article which bears a very close resemblance to merino is tibet.

MERINO SHEEP, a particular variety or breed of sheep, specially referred to Spain, the long fine wool of which was formerly much valued from its use in the manufacture of the fabric known as *merino*. The wool of many of our English breeds has so greatly been improved by attention to breeding that English wool is now employed for most of the purposes for which merino wool was so long and justly celebrated. The merino breed, whilst not attracting the same attention as formerly, is still kept up in Spain and France, the wool being still valued in the production of a durable fabric. See SHEEP.

MERIONETH, or MERIONETHSHIRE, a maritime county in North Wales, bounded on the north by Carnarvonshire and Denbighshire, north-east by Denbighshire, east and south by Montgomeryshire, south by Cardiganshire, and south-west and west by Cardigan Bay, an inlet of the Irish Sea; area, 384,717 acres. Nearly the whole surface is covered with wild and barren rocks and mountains, some of them of considerable height, rugged and picturesque. The highest summits attain an elevation of 2500 feet to 2900 feet. One of the most remarkable of these peaks, though not the loftiest, is Cader Idris, the summit of which consists chiefly of immense columns of highly crystalline greenstone, similar to those forming the Giant's Causeway in Ireland. Slate-rocks almost entirely occupy the county. The principal minerals are lead and copper ores, and slates. The copper ores have been worked to a great extent. Limestone is also quarried in great quantities, particularly the white limestone. There are numerous rivers and lakes; but with one exception, they are mostly small. The largest lake, Tegid or Bala Mere, is nearly 12 miles in circumference. Numerous marshes occur along the sea-coast. In the larger valleys, and near the coast, the climate is mild; but on the mountains it is cold and tempestuous. The soils are various; those of the low lands are very fertile. Oats form the chief grain crop, but barley is also extensively grown; wheat is raised on the best soils. Potatoes are grown very generally, and fruit-trees are profitably cultivated throughout the whole of the county. Considerable quantities of cheese and butter are made. The cattle and sheep here are small and hardy. Great numbers of the diminutive race of ponies called *merlins*, are reared. The chief manufactures are a peculiar kind of cotton cloth, called 'Welsh plains,' and knitted woollen stockings and socks. Principal town, Dolgelly. Pop. in 1801, 38,963; in 1881, 52,038.

MERLE D'AUBIGNÉ, JEAN HENRI, an ecclesiastical historian, and an accomplished theologian, was born at Geneva in 1794. His father, Louis Merle, a merchant, was the grandson of Aimé Merle, whose wife was a Mademoiselle D'Aubigné, the daughter of a French Protestant family of distinction, whose surname was assumed by her grandson as an honourable addition. His education, commenced at Geneva, was completed at Berlin under the eminent and saintly Neander. He began his pastoral duties at Hamburg to a French congregation, and removed afterwards to Brussels, where he proved himself an acceptable preacher. Returning to his native city in 1830 he resided there till his death, 21st Oct. 1872, discharging the duties of professor of church history in the theological school founded by the Genevan Evangelical Society. The first volume of his celebrated History of the Reformation of the Sixteenth Century was published in Paris in 1835, the remaining volumes appearing at intervals. In Britain and America it was welcomed with enthusiasm; and no religious publication of the age achieved with greater rapidity a more secure popularity. His other works are, The Protector (Cromwell): a Vindication, 1847; and in the following year appeared Germany, England, and Scotland Recollections of a Swiss Minister. A number of his sermons have also been published. Merle D'Aubigné was always a prime favourite with the religious world of Britain and America, and his various publications have been almost all translated into English. In 1856 he was presented with the freedom of the city of Edinburgh; and nowhere was he more highly appreciated than in Scotland.

MERLIN, a British prophet, who flourished about the latter end of the fifth century. The accounts we have of him are so mixed up with fiction that to disentangle his real life from the mass would be impossible. He was said to be the son of a demon and the daughter of a British prince, and was brought up at Caer-Merlin, a city supposed to be the modern Carmarthen. He was instructed by his father in all branches of science, and received from him the power of working miracles. He was the greatest sage of his time, the counsellor and friend of four English kings, Vortigern, Ambrosius, Uther Pendragon, and Arthur. Vortigern, at the advice of his magicians, had resolved to build an impregnable tower, in order to secure himself against the Saxons; but the foundation was scarcely laid when the earth opened by night and swallowed it up. The magicians informed the king that to give firmness to the foundation he must wet it with the blood of a child born without a father. After much search the young Merlin was brought to the king. After Merlin had heard the dictum of the magicians he disputed with them, and showed them that under the foundation of the tower was a great lake, and under the lake two great raging dragons, one red, representing the British, one white representing the Saxons. The earth was dug open, and no sooner were the dragons found than they commenced a furious battle; whereupon Merlin wept, and uttered prophecies respecting the future state of England. The miracles ascribed to him are numerous. Instead of dying it was supposed that he fell into a magic sleep, from which, after a long period, he would awake; and to this Spenser alludes in his Faery Queen. He is also mentioned in Tennyson's Idylls of the King. In the British Museum is Le Compte de la Vie de Merlin et de ses Faiz et Compte de ses Prophécies (two vols. folio, on vellum, without date or place). We have also the Life of Merlin,

surnamed Emyrs or Ambrosius, by T. Heywood. See Warton's History of Poetry, Spenser's Faery Queen, and Ellis's Specimens of Early English Metrical Romances. A collection of the prophecies attributed to him appeared at Paris in 1498, at London in 1529 and 1533, at Venice, 1554. They can be traced back to about 1360. The Strathclyde Britons had also their traditions of a prophet and enchanter named the Caledonian Merlin, who flourished at a somewhat later date than the Cambrian one, being a contemporary of St. Kentigern, bishop of Glasgow. His prophecies were published at Edinburgh in 1615, and contained those ascribed to the Welsh Merlin as well as his own.

MERLIN. See FALCON.

MERLON, in fortification, is that part of a parapet which is terminated by two embrasures of a battery. Its height and thickness are the same with that of the parapet, but its breadth is generally 9 feet on the inside and 6 on the outside. It serves to cover those on the battery from the enemy; and it is better when made of earth well beat and close than when built with stones, because they fly about and wound those whom they should defend.

MERMAID (Anglo-Saxon, *mere*, sea), a fabulous creature, celebrated in the mythical and legendary tales of sailors, and described as possessing the upper part of the body of a woman united to the tail of a fish. Added to this structure mermaids were described as generally possessing great charms and personal beauty, and they were also credited with using these charms for the purpose of luring unwary and amorous mariners to destruction by enticing them into the depths of the sea. The stories of mermaids and mermen are probably founded on, and have taken origin from, the suggestive appearances of some aquatic mammals, which, in certain positions, and especially when viewed from a distance, bear a very close resemblance to human figures standing or sitting in the sea. In particular the manatees (which see) or sea-cows, with an intelligent or somewhat human-like expression of countenance, have been mistaken for human figures. These huge forms inhabit the mouths of African and American rivers, and frequently assume a semi-erect posture; and as the mammæ are situated upon the breast, as in woman, the resemblance to the human figure is exceedingly close and apparent, even at a short distance off. The Portuguese have thus named the manatee by the popular appellation of 'woman-fish.' The paddles or anterior limbs of these forms may also be moved about in a manner suggestive of the motions of the human arms, and in this way the resemblance to the human figure is increased. Certain species of seals also possess the habit of rising partly out of the water, and the vivid imagination of mariners may naturally invest the intelligent countenances of many of these forms with the likeness of the 'human face divine.' Captain Scoresby mentions that he has frequently beheld the manatees in positions exceedingly suggestive of the human appearance; and the surgeon of his ship on one occasion reported to Scoresby that he had seen a man with his head appearing just above the surface of the water—this head, however, being merely that of a manatee.

MEROE, a city and state of ancient Ethiopia, in the north-easterly part of Africa, upon a fruitful peninsula surrounded by sandy deserts and bounded by the Astapus (Bahr el Abiad or White Nile) on the west, and the Astaboras (now the Tacazze) on the east as far as the modern province of Gojam. It now forms the district of Atbara, between 13° and 18° N. lat., with a town of the same name, and lies in the Kingdom of Sennaar, which constitutes a part of Nubia. It was a district of great opulence, being distinguished equally for its mineral and cereal wealth, and was consequently at an early date the centre of an active and varied commerce. The people of the ancient priestly state of Meroe, according to Herodotus, were negroes. They had a fixed constitution, a government, laws, and religion, acknowledging for gods Zeus and Dionysus (Ammon and Osiris). The government was in the hands of a caste of priests, who chose a king from their own number, who was obliged to live and act according to certain prescribed rules. The priests at Meroe could doom the king to death in the name of the gods, and he was forced to submit. Ergamenes, king of Meroe in the third century B.C., during the reign of Ptolemy II. in Egypt, first made himself independent of this oppressive priesthood by murdering the priests in the golden temple. Meroe was the centre of the great caravan trade between Ethiopia, Egypt, Arabia, Northern Africa, and India. The priests were of a lighter complexion than the other inhabitants, and may have come from India. Ammonium (see AMMON and OASIS), the modern Oasis of Siwah, also was a small priestly state with a king, founded by Egyptians and by Ethiopians from Meroe. Meroe and Axum (in Abyssinia), which appears to have been also a colony from Meroe, remained the centre of the southern commerce till the time of the Arabians. The existing monuments of their architecture, and many other vestiges of them, prove their early religious and social cultivation. From what little we know with certainty of the civilization of Meroe, we are justified in surmising that it was originally colonized from Egypt, though afterwards sending out colonies itself.

MEROVINGIANS, the first dynasty of Frankish kings which ruled in the northern part of Gaul, since called France. They derived their name from Merowig (Merovæus), the grandfather of Clovis. They ruled from 496 till 752, when they were supplanted by the Carlovingians. Thierry (Lettres sur l'Histoire de France) has shown that this revolution was a national change, the second dynasty being Eastern Franks (Austrasians), who had become predominant over the Neustrians or Western Franks, to whom the Merovingians belonged. See FRANCE.

MERRIMAC, a river in the United States, formed at Franklin, New Hampshire, by the union of two streams; flows first south for 78 miles to Chelmsford in Massachusetts, and then east for 35 miles to its mouth in the Atlantic at Newburyport. Though comparatively insignificant in both length of course and volume, it would be difficult to find a river which has done more for the country through which it flows, since the immense water-power furnished by its falls has created the towns of Lowell and Lawrence in Massachusetts, and of Nashua and Manchester in New Hampshire.

MERSEBURG, a town, Prussian Saxony, capital of the government of Merseburg, on the left bank of the Saale, 14 miles west of Leipzig, on the railway thence to Eisenach, connected by a bridge with suburbs on the opposite side of the river. It is walled, has an old castle, originally an episcopal palace, afterwards the residence of the dukes of Saxe-Merseburg, and now used for public offices; a fine Gothic cathedral on a rock overhanging the river, with a richly-decorated portal and an organ with 4000 pipes, one of the largest in Germany; the church of St. Thomas, and three other Lutheran churches; old and new town-houses, old monastery of St. Peter; several schools, an orphan hospital, &c.; manufactures of machinery, leather, stained paper, pasteboard, tobacco, and glue; and extensive breweries and distilleries. The general assembly of the states of the province is

held here every second year. Pop. 15,205.—The government of Merseburg belongs to the basin of the Elbe, has an area of 3924 square miles, with valuable minerals, and considerable manufactures. Pop. 971,098.

MERSEY, an important river, England, has its rise in the range of hills on the south-west confines of Yorkshire, at the point where Cheshire and Derbyshire join the former. It flows in a general south-west direction to Runcorn, where it expands into an estuary 2 to 3 miles broad, on the north side of which is the great commercial port of Liverpool, and below which it joins the Irish Sea. The entire length of the river, including the estuary, is from 55 to 60 miles. Principal affluent, the Irwell, to which it is navigable. The Bollin and the Weaver are affluents from Cheshire, and at its confluence with the latter it expands into the estuary which forms the Liverpool channel. Though the channel is encumbered with sandbanks, the pilotage is on such an excellent system that few accidents from this cause occur.

MERTHYR-TYDVIL, a market town and parliamentary borough of South Wales, in the north of the county of Glamorgan, 24 miles N.N.W. of Cardiff, on the Taff, at the northern extremity of Taff Vale, and in connection with all the main railways. It has risen up from a mere village in 1780 to a place of great extent and importance; and though consisting generally of irregular assemblages of workmen's houses situated on both sides of the river, and communicating by two bridges, has recently undergone important changes, which have greatly improved its sanitary condition and general appearance. The principal thoroughfare contains good shops and dwellings, and near its centre is one of the most spacious and splendid market-places in Wales. The public buildings and institutions include several Established churches and chapels of ease, and numerous places of worship belonging chiefly to the Calvinistic, Wesleyan, and other Methodists, Independents, Baptists, &c.; Board, National, and other schools, a mechanics' institute, a drill-hall, a theatre; while in the vicinity Cyfarthfa Castle with its park, and Pen-y-Darren Grammar School form conspicuous and pleasing objects. The town owes its prosperity to its situation near the centre of the valuable coal and mineral field of South Wales. The mines are extensively worked, and among the important steel and iron works which have been established those of Dowlais alone, when in full work, employ over 10,000 persons. Among those to whom the town owes much for its rapid development are Anthony Bacon and Richard Crawshay, the former having formed the first highway, and the latter having aided to secure the construction of the Glamorgan Canal, and these for nearly forty years were the only outlets for the rapidly-developing iron-trade. There are now three railways—the Taffdale (1842), the Vale of Neath (1851), and the Brecon Railway (1863). There is not as yet a town-hall nor a public park. There is an ample water supply, and the sewerage is utilized in attempting to reclaim waste lands. The shipping-ports are Swansea and Cardiff, particularly the latter, to which, in addition to the railways already mentioned, there is access by the Glamorganshire Canal. The borough sends two members to Parliament. Pop. of parl. bor. in 1871, 97,020; in 1881, 91,373.

MERTON COLLEGE, Oxford, was first founded at Maldon in Surrey in 1264 by Walter de Merton, bishop of Rochester and lord high-chancellor of England, and is the model of all the secular colleges. It was removed to Oxford in 1270, at all events before 1274, and was a great means of determining the locality of the present university. The foundation consists of a warden, twenty-four fellows, eighteen post-masters, four scholars, and two chaplains. Archbishop Laud, after some changes, fixed the number of fellows at twenty-four, though the intention of the founder was that the number should be co-extensive with the means of maintaining them. The post-masters, formerly termed *portionists*, owe their endowment to Dr. Wylliot, chancellor of Exeter, who in 1380 endowed twelve. Their standing is equivalent to that of the scholars of other colleges, and their number has been increased to eighteen. This has been effected by the suspension of six fellowships, the endowment of which has been devoted not only to increase the number of postmastership, but also to found the Linacre professorship of physiology. But it is intended to restore the original number of fellowships, and that this may be accomplished the present expenditure is strictly controlled. The college possesses seventeen benefices, to one of which the Archbishop of Canterbury nominates and the college presents; to another the same dignitary collates one of the fellows, or one who has been a fellow; while to a third the Bishop of Oxford presents alternately with the college.

MERU, MOUNT, in the Hindu cosmology and mythological geography, the sacred mountain, on whose summit resides Siva in the centre of the world, and sustaining and uniting earth, heaven, and hell. It is the Olympus of India.

MESENTERY (Greek, *meso*, middle; *enteron*, the bowel), the broad fold of the *peritoneum* (or lining membrane of the abdominal cavity) which suspends the small intestines to the back wall of the abdomen. It takes origin from the second lumbar vertebra on its left side, extends obliquely across the spine to the right side, and is there attached in the basin or *fossa* of the right iliac bone. The opposite edge of the mesentery is attached to the intestine, and is puckered up in folds. It supports the small intestines from the jejunum to the end of the ileum. The mesentery measures about 4 inches in breadth from its attachment to the spine to its intestinal border. It exhibits at the latter border a division into two layers, which inclose the intestine and constitute the peritoneal covering of the bowel; and between the mesenteric layers the mesenteric vessels, nerves, and glands, and the lacteals or lymphatic vessels (which see) of the intestines ramify and are contained. The above remarks apply to the structure to which the distinctive name of 'mesentery' is specially applied. But there are other peritoneal folds supporting other portions of the alimentary tract which may be briefly noticed in connection with the present subject. The fold known as the *meso-cæcum* attaches the posterior portion of the cæcum to the right iliac fossa. The *ascending meso-colon* similarly attaches the posterior part of the ascending colon to the hinder abdominal wall. The *transverse meso-colon* and *descending meso-colon* connect the transverse colon and descending colon respectively with the posterior wall of the abdomen. The *meso-rectum* attaches the upper part of the rectum to the front of the sacrum. The *omenta* are the peritoneal folds which connect the stomach to neighbouring organs. The *lesser* or *gastro-hepatic omentum* extends between the transverse fissure on the under surface of the liver to the upper surface of the stomach at its lesser curvature. This fold consists of two layers of peritoneum. The *greater* or *gastro-colic omentum* consists of four layers, and arises from the lower border of the stomach. It descends into the pelvis, and overlies the small intestines, and in its ascending course encloses the transverse colon. In adult life the separate layers of this latter structure become more or less amalgamated; and in fat persons this omentum, usually thin, becomes greatly

loaded with adipose tissue. The *gastro-splenic omentum* connects the spleen to the greater curvature of the stomach, and joins the great omentum inferiorly.

MESHID, or MUSHED, a town of Persia, capital of the province of Khorasan, in an extensive valley of same name, 500 miles north-east of Ispahan. Near the centre of the town there is some degree of bustle, but elsewhere little is seen except extensive burying-grounds and endless tracts of ruins. Its principal street, however, is spacious and handsome. An aqueduct, the banks of which are shaded by trees, passes through it, while at its extremity are seen the splendid cupola and gilded minarets of the shrine of Iman Ruza. The shrine is entered by a silver gate, the gift of Nadir Shah, and has a very gorgeous interior, a vast hall, like the central nave of a cathedral, rising loftily into a central dome ornamented with the richest colours and a profusion of gold and azure. Connected with the shrine by a broad passage is the mosque of Gohur Shah, considered one of the most beautiful and splendid in Persia. The chief manufactures are velvets, sword-blades, and some silk and cotton goods. A considerable number of the inhabitants are employed in cutting gems, obtained from the turquoise-mines in the vicinity. The situation of Meshid on the great caravan routes of Persia make it an important entrepôt for the produce of surrounding countries, and rich caravans are daily arriving from Bokhara, Khiva, Herat, Kerman, Yezd, and other quarters. In the neighbourhood the ruins of Thus are situated, containing the tomb of the poet Firdûsi. Pop. estimated at about 70,000.

MESMER, FRIEDRICH ANTON, a German physician, author of the famous doctrine of animal magnetism, called also *mesmerism*, born at Meersburg in Suabia in 1734. He first made himself known in 1766 by the publication of a thesis, De Planetarum Influxu, in which he maintained that the heavenly bodies exercised an influence on the bodies of animals by means of a subtle fluid diffused through the universe. To this whimsical association of the Newtonian philosophy with the reveries of astrologers he added the notion of curing diseases by magnetism. Father Hell of Vienna had previously performed some pretended cures by the application of magnets, and he, considering Mesmer as a rival, charged him with borrowing, or rather stealing, his invention. Mesmer therefore renounced the use of common magnets, and declared that his operations were conducted solely by means of the magnetism peculiar to animal bodies. He had little success at Vienna, and his applications to the Academies of Sciences at Paris and Berlin and the Royal Society of London were treated with neglect. After an abortive attempt to cure Mlle. Paradis, a celebrated blind musician, by the exercise of his art, he quitted Vienna for Paris in 1778. There he for some time in vain endeavoured to attract the notice of men of science, and demanded from the French government the gift of a castle and estate as a reward for his pretended discoveries. The Baron de Breteuil actually carried on a negotiation with him, offering him a large pecuniary reward if he would establish a magnetic *clinicum* and instruct three persons chosen by government in his process. The latter condition induced him to reject the proposal, and he removed with some patients to Spa. A subscription was opened to induce him to return to Paris and reveal the principles of his professed discovery. He consequently went thither, gained a number of proselytes, and received 340,000 livres. Government at length appointed a committee of physicians and members of the Academy of Sciences, among whom was Franklin, to investigate his pretensions; and the result of their inquiries appeared in an admirable memoir drawn up by M. Bailly, which completely exposed the futility of animal magnetism and the quackery of its author. He afterwards resided some time in England under a feigned name, and then retired to Germany, and in 1799 published a new exposition of his doctrine, which attracted no notice. He died at his native place March 5, 1815. He was the author of Mémoire de F. A. Mesmer sur ses Découvertes, and other pieces. See MAGNETISM (ANIMAL).

MESNE LORD (from Latin *medianus*, and that from *medius*, middle, intermediate), signifies one who is lord of a manor and has tenants holding of him, yet himself holds of a superior lord. But subinfeudation having been abolished during the reign of Edward I. the term is not now used, and is merely a legal relic.

MESNE PROCESS, an intermediate process which issues pending the suit upon some collateral interlocutory matter. Sometimes it is put in contradistinction to *primary* and *final process*, or *process of execution*, and then it signifies all such processes as intervene between the beginning and end of a suit.

MESOPOTAMIA (Greek, *mesos*, middle, and *potamos*, river, signifying the land between the rivers, and called by the Arabians *Al Jezireh*, or the island). The Greeks called by this name the extensive region inclosed by the Tigris and Euphrates, and bounded on the north by the Taurus and Masius; but the name is generally applied to the northern part of this region, which is mountainous, and rich in grain, wine, and pasturage; the southern part being flat, dry, and unfruitful. The principal cities were Charran or Charræ, Edessa, Zoba (Nisibis), Antioch, Mygdoniæ, and Singara. Its Old Testament name is *Aram Naharaim*, or Syria of the Two Waters; and also *Padan Aram*, or Syria of the Plain. The Greek title was probably not in use till after Alexander the Great invaded the East. This country has always been inhabited by husbandmen, who live a settled life, and by shepherds, who wander from place to place. The Mesopotamians sprang from the Chaldeans, the primitive inhabitants; from the Cushites, who in the reign of Nimrod built the cities of Edessa and Nisibis; and from the descendants of Shem, of the tribe of Thara. The latter first inhabited the region around Ur Chasdim, and then dwelt in and around Haran or Charræ; but in process of time they spread throughout the whole country, even into Chaldea and Syria, so that the Cushites were compelled either to retire before them or submit to them. It was originally a part of Nimrod's dominion. After an interval of more than 700 years (B.C. 2000) Cushan Rishathaim reigned in Mesopotamia, who extended his dominion over the Euphrates. The Israelites, who then possessed Palestine, were compelled to pay him tribute for the space of eight years. In the golden age of the Assyrian power (790 years B.C.) Mesopotamia was entirely subjected to that empire, and suffered the fate of its subsequent conquerors. Trajan subjected it to the dominion of Rome A.D. 106, but the Persians did not suffer the Romans to remain long in undisturbed possession of it. It was a constant cause of war between the Persian and Roman Empires, and at last Jovian surrendered it to the Persians, A.D. 363. When the Arabs in 651 established a new empire upon the ruins of the kingdom of the Sassanidæ, Mesopotamia was also obliged to submit to the storm. In the year 1040 it fell into the hands of the Seljuks. From that time it had many rulers in rapid succession. Genghis Khan made himself master of it in 1218, but in the year 1360 it fell into the hands of Tur Ali Bey. Forty years afterwards Mesopotamia was conquered by Timur, and in 1514 Ismael Sophi incorporated it with the Persian Empire. The Persians were, how-

ever, in 1554 compelled to cede more than half of it to the Turks; and though they again in 1613 recovered the lost portion, they were unable to withstand the attacks of Amurath IV., who united this in 1637, with many other provinces, to his empire.

MESOTYPE. See NATROLITE.

MESS (from Italian *messo*, a dish), in sea language, denotes a particular company of the officers or crew of a ship, who eat, drink, and associate together, whence *messmate*, one of the number thus associated. The technical meaning of messing, as applied to officers, does not hold with regard to common seamen. *Losing the number of the mess* is a phrase for dying suddenly, being killed, or drowned. In military language mess denotes a sort of military ordinary, for the maintenance of which every officer who takes his meals there gives a certain proportion of his pay. These associations of officers in the British armies exist not merely in time of peace, but even in the field; and foreigners are surprised at the degree to which the national love of comfort prevails even amid the fatigues of service, leading the officers to carry with them loads of table equipage, thereby adding to the cumbrous baggage of a British army. In all the descriptions of the British military life the mess is conspicuous; and it may be easily imagined that these social meetings, when the toils of service are suspended, and the pleasures of the table are heightened by music; when the restraints of military etiquette are relaxed, and a soldier-like frankness prevails—are among the bright spots of British military life. As it is important that the mess should be well regulated, there are stringent rules established for its regulation. One officer is appointed caterer, who receives subscriptions from the individual members, and charges each for extra expenses; while a steward takes charge of the cooking and the entire menial department. Each officer pays, generally weekly, his share of the necessary expenditure. In the navy the expense is limited; not so in the army, though the officer in command has instructions to enforce a wise though not an unseemly economy. Government votes a sum annually to keep down the expenses of the military messes. Married officers, though requiring to subscribe the regulation entrance-fee, are not compelled to use the mess-table except when they please, and then they pay only their share of the consumption. There is also a sergeants' mess, the sergeants drawing rations which they are at liberty to supplement; and officers can draw rations if they choose, which they seldom fail to do on foreign stations. The staff-officers with an army have no mess, as they are considered to belong to the family of their chief; but they can form private arrangements for themselves. Several armies, particularly the Prussian, have attempted in time of peace to imitate the British mess, but without being able to copy it fully.

MESSALINA, VALERIA. This notorious Roman empress, the daughter of M. Valerius Messala Barbatus, and third wife to the Emperor Claudius, has left behind her the infamy of having surpassed in licentiousness the most abandoned women of any age. She was besides as cruel as she was licentious, and procured the death of many members of the most illustrious families at Rome whom she either feared or hated. She had all the males belonging to the household of the emperor for her lovers: officers, soldiers, slaves, players—nothing was too low for her. Not satisfied with her own shame, she even compelled the most noble Roman ladies to commit in her presence similar excesses. Whosoever did not comply with her wishes she punished with death. She at length went so far as, during the lifetime of her husband, publicly to marry Caius Silius, a handsome Roman youth, while the weak Claudius, who alone was ignorant of her infidelities, was at Ostia, A.D. 48. Narcissus, a freedman and favourite of the emperor, formerly a paramour of the empress, discovered to Claudius, who was then absent from Rome, this new act of infamy on the part of Messalina. But Claudius delayed to punish her; and Narcissus, seeing that his own life was at stake if the empress should succeed in recovering the favour of her weak and infatuated husband, gave orders to murder her secretly. She was put to death by a tribune of the guards in the gardens of Lucullus.

MESSANA. See MESSINA.

MESSENGERS, KING'S or QUEEN'S, certain officers employed by the secretaries of state, who are always ready to convey despatches foreign and domestic. They used formerly to be chiefly employed in serving the secretaries' warrants for the arrest of persons charged with treason or other grave state offences, which did not properly come within the cognizance of the common law, and which it was inexpedient to divulge in the ordinary course of justice. It was not unusual for them to detain persons so apprehended at their own houses. Their duties are now confined for the most part to foreign service.

MESSENGERS-AT-ARMS, officers appointed by the Lyon King-at-arms, and under his control, employed in executing all summonses and letters of diligence both in civil and criminal cases that are to be tried before the Courts of Session and Justiciary in Scotland. Signet-letters were devised by the judges of the King's Court as substitutes for the ancient writs of the law, and were directed to messengers-at-arms as being sheriffs in that part. A messenger cannot execute diligence for his own behoof or for that of another party on a bill endorsed by himself, nor can he act as procurator before a sheriff-court.

MESSENIA, a country of ancient Greece, in the southern part of the Peloponnesus. Its later capital was Messene (Mavromati), with the mountain fortress Ithome; Mothone (Modon), Korone (Coron), and Pylos (Navarino), with the stronghold Pherä, now Calamata, were its principal ports. On its southern coast lay the Messenian Gulf (now the Gulf of Coron). A ridge of Mount Taygetus separated Messene from Sparta. Messenia is celebrated for the long struggle of its inhabitants with the Lacedæmonians in defence of their liberty. In the first Messenian war (743–723 B.C.) the Lacedæmonians, with the Athenians, invaded Messenia, notwithstanding the proposal of the Messenian king to submit their differences to the arbitration of the Areopagus or the Amphictyonic Council. For twenty years the Messenians defended themselves valiantly under their king Aristodemus, who, in consequence of an answer of the Delphic oracle, which promised them the victory on condition of the sacrifice of a virgin of the royal family, offered his own daughter as the victim. Her lover, to save her life, declared her to be pregnant by himself; and Aristodemus, to prove her innocence, stabbed her with his own hand, and caused her to be opened and sacrificed. The Messenians, though for some time successful, were finally obliged to submit by the loss of Ithome. About forty years after they again rose, and thus commenced the second Messenian war (685 B.C.), which ended in their subjugation. (See ARISTOMENES.) A part of the Messenians are said to have emigrated to Sicily, and there to have founded Messana (see MESSINA) on the site of the ancient Zancle (668 B.C.) But this account is less probable than that which makes Anaxilas (died B.C. 476) change the name from Zancle to Messana or Messene, both because he himself was a Messenian, and because he had transferred to the

place a body of Messenians from Rhegium. After 200 years of servitude the Helots (see HELOTS) and Messenians took up arms. This third Messenian war lasted ten years (465–455 B.C.), and resulted in the expulsion of the Messenians from the Peloponnesus. Epaminondas restored them, gathering together the exiles from the various lands in which they were scattered. They now, within the space of eighty-five days, completed and fortified Messene (369 B.C.), and maintained their independence till the country was conquered by the Romans (146 B.C.) The Messenians remained true to their customs, manners, and language through all changes of fortune.

MESSIAH (Hebrew, *Mashiach*), corresponding to the Greek *Christos* of the New Testament, that is, 'anointed,' has in the Old Testament several applications, as to the whole Jewish people, to the priests, to the kings ('the Lord's Anointed'), and even to Gentile kings, as persons who had been anointed with holy oil. A more particular application, however, which it began to receive after the time of Solomon, was to the expected deliverer and Saviour of the Jews, to be sent by God for the purpose of restoring the glories of the house of David, and to be himself called 'the Son of David.' This conception was still too narrow for the glowing descriptions of the prophets, and it came to be extended so as to include the Saviour of all men, though the proverbial exclusiveness of the Jews prevented this conception from ever receiving its full pregnancy of meaning. These descriptions and prophetic allusions are known as the Messianic prophecies, the first series of which, though, as might be expected, comparatively meagre and obscure, is to be found in the Pentateuch, as in the account of the fall (Gen. iii. 15), in the mention of the coming of Shiloh (Gen. xlix. 10), and in the prophecy of Balaam (Num. xxiv. 17–19); but a series belonging to the time of David is fuller and clearer. A kingdom is promised to David and his house 'for ever,' a promise that could scarcely be fulfilled but by a member of the line of David entering on an eternal kingdom. Numerous passages in the Psalms are in the New Testament quoted as applying to the Messiah. The third series belongs to and comprehends the period from the reign of Uzziah to the Babylonish captivity, when the expansion of the Messianic idea recognized that Messiah was about to bring blessings to the Gentiles as well as to the Jews; that he was to be a suffering Redeemer; that he was to be of the lineage of David, and born in a particular locality; that he was to have a forerunner; and that he was to come in the time of the second temple. After this period the views of the Jews regarding the Messiah are mainly obtained from allusions in the New Testament, and it would seem that the general expectation was now for a temporal prince only. The expectations of a golden age, common in heathen nations, were not, like those of the Jews, associated with the coming of a particular person, the Messiah; nor can the idea of the coming of such a person as the Messiah of the prophets be accounted for otherwise than as arising from a divine revelation. This Messiah was to be a Priest as well as a King, was to free the people from their sins, and unfold to them the ways and will of God. The extension of the blessings of his mission beyond the narrow circle of Judaism grew from the circumstance of the Messianic idea in the prophecies being a direct revelation from God, which was ever gaining in clearness and catholicity; and the witness of the New Testament to the prophecies of the Hebrew Scriptures cannot bear any other construction. See 2 Pet. i. 19–21—'We have also a more sure word of prophecy; whereunto ye do well that ye take heed. . . . For the prophecy came not in old time by the will of man; but holy men of God spake as they were moved by the Holy Ghost.' Jesus Christ affirms that the Old Testament Messianic prophecies are fulfilled in him, an affirmation indorsed by the apostles. The great stumbling-block to the Jews' acceptance of Christ as the Messiah was his crucifixion, their expectation being that, as the kingdom of the saints was to be 'an everlasting kingdom,' the Messiah should live for ever. So prevalent and wide-spread was this expectation that even his disciples did not comprehend his allusions to his death. The expectation of the Jews, as expressed in the Talmud, that the true Messiah was to be preceded by another Messiah, who should be a sin-offering for the people, has given occasion for the rise at different times, even as late as last century, of false messiahs, who may have been impostors, but who may also have been fanatical and dreaming self-deceivers. A certain school of theologians, the strictly rationalistic school, holds a somewhat similar view with regard to the appropriation of the Messianic prophecies to himself by Jesus Christ, as it asserts that he laid claim to the dignity either to meet the preconceptions of his countrymen, or because he felt that the truth which he taught was the real 'kingdom never to be destroyed,' which 'the God of heaven was to set up' (Dan. ii. 44). This principle of accommodation or of spiritual application is repudiated by orthodox theologians, who hold the literal and exclusive application of the Messianic prophecies to 'Jesus of Nazareth.' The Greek form of Messiah, found in John i. 41; iv. 25, is *Messias*. See Smith's Dictionary of the Bible; also the second edition of Hengstenberg's Christologie, translated in Clark's Foreign Theological Library.

MESSINA (ancient Greek name, *Zancle;* Latin, *Messana*), a town and seaport of Sicily, capital of the province and on the strait of the same name. Messina is walled, flanked by bastions, and defended by a citadel on the south, and several forts both on the east and west. The harbour is one of the best in the Mediterranean, and so much resembles a sickle that the town took its original Greek name from that implement, called *zancle*. The circuit of this splendid basin is about 4 miles. Fronting the harbour is a broad quay, called the Marina, adorned with statues and fountains, and forming the favourite promenade. Messina was formerly ill cleaned, the streets narrow, and the houses so high as to exclude both light and air. The modern town, built since the earthquake of 1783, is generally composed of houses of two stories, and has spacious streets, well paved with blocks of lava. Among the public edifices are included nearly fifty churches, many of them of great beauty, and adorned with fine sculptures and paintings. The cathedral is a Gothic structure, with a somewhat heavy exterior, but supported within by vast pillars of granite, supposed to have belonged to a temple of Neptune. The viceroy's palace, the archiepiscopal palace, the senate-house, grand seminary, college, large and well-endowed hospital, numerous convents, two theatres, lazaretto, and arsenals, are some of the other buildings worthy of notice. The manufactures consist chiefly of silk goods. The trade, both transit and general, is extensive. The principal exports are silks, olive-oil, linseed and other seeds, oranges, lemons, and other fruits; corn, wine, and spirits; salted fish, liquorice, lemon-juice, shumac, essences, rags, brimstone, &c. The tunny and other fisheries are carried on to a considerable extent. In 1882 the value of the exports amounted to £2,181,334; of the imports, £1,074,239. Messina is the see of a Roman Catholic archbishop and archimandrite, and a Greek protopapa. It possesses a college, with a full complement of professors in belles-lettres, philosophy, law, and medicine; and a naval seminary.

Messina, under its original name of Zancle, is said to have been founded 1004 years B.C. The Messenians having afterwards obtained possession of it (668 B.C.) called it Messana (but see MESSENIA). Pop. in 1881, 126,497.

MESSINA, STRAIT OF (Italian, *Faro di Messina;* Latin, *Fretum Siculum*), a strait which separates Sicily from Italy, and communicates between the Tyrrhenian and the Ionian Sea. It has a length of about 20 miles, and gradually widening towards the south, attains, on the parallel of 38°, a width of 11 miles; but in the north, where it is narrowest, does not exceed 2 miles. The depth is great, and a strong current continually running with the tide makes the navigation somewhat difficult, but by no means so formidable as was fabled by the ancients, to whom the rock of Scylla, and that of Charybdis, on the opposite side of the strait, but at some distance to the south, seemed so dangerous that it was generally believed to be almost impossible to avoid the one without being dashed upon the other.

MESSUAGE, in English law, is the term used for a dwelling-house with its out-buildings, courtyard, and a piece of land adjoining assigned to the use thereof. In Scottish law it denotes the principal dwelling-house of a baron, being synonymous with the English *manor-house*.

MESTIZOS, or METIS (Spanish, *mixed*). In countries where Spanish Europeans have settled and intermingled with the natives, the descendants are called *Mestizos*. In Mexico the European Spaniards were called *Chapetones* or *Gachupines*. The pure descendants of Europeans are called *Creoles* (see CREOLES) in similar countries. The Mestizo is described as having a transparent skin, a thin beard, small hands and feet, and a certain obliquity of the eyes. If a Metis marry with a white, the fruit of the union differs but slightly from a European.

METACARPUS. See HAND.

METACENTRE. See HYDROSTATICS.

METALLOID, a name derived from the Greek *meta'llon* = metal, and *eidos* = likeness, and used to designate those chemical elements which are not possessed of the characteristic properties of the metals (which see). It is very difficult to say exactly wherein the metalloids differ from the metals. Between the extremes of each class the difference is well marked, but the two classes gradually shade off into each other. The metalloids are as a rule more ready to enter into combination with one another than the metals. In compounds the metalloids are said to play a chlorous part, but even this distinction is not absolute. The elements which are usually classed as metalloids are the following:—*Boron, bromine, carbon, chlorine, fluorine, hydrogen, iodine, nitrogen, oxygen, phosphorus, selenium, silicon, sulphur*, and *tellurium*. For a fuller discussion of the relations existing between metals and metalloids, see the article on METALS.

METALLURGY, METALLURGIC CHEMISTRY, is that part of chemistry which teaches the methods of extracting the metals from their ores, the analyses of metals, &c. See the articles on the different metals.

METALS. To define the meaning of the word metal is at present impossible. The chemical elements are usually divided into the two classes of metals and non-metals or metalloids, but this classification is at best but vague. The ideal type is more or less realized in all the metals, but a typical classification is necessarily unsatisfactory. It is almost impossible to lay down the exact characteristics of the type, nor is it always easy to relegate to another class substances which differ but slightly from those which are generally believed to embody most fully the characteristic features of the type. Substances which have long been commonly called metals are found to be easily worked under the hammer without disintegration of the mass; this property of *malleability* was long also adopted as the distinguishing feature of metals: but it was shown that the difference in malleability between certain of the acknowledged metals was as great as that between some of the metals on the one hand and the so-called semi-metals on the other hand. Other properties were then fixed on as the characteristics of the class of metals, but these in their turn had to be abandoned; so that at present the claims of any element to be admitted among the metals rest not upon any single property but upon the possession in a greater or less degree of very many characteristics. The chief of these characteristics are the following:—(1) *Malleability*, or the capability of being easily worked under the hammer; (2) *ductility*, which expresses the fact that metals may be drawn into wires; (3) *tenacity*, or the resistance to force tending to tear asunder the mass; (4) *elasticity*, or the power which a bar of metal possesses of recovering its original shape after having been bent or stretched; (5) *electric conductivity*, or the power of conducting electricity; and (6) *thermal conductivity*. Besides these purely physical characteristics the metals are possessed of chemical features, by which they may be distinguished to a certain extent from the other elementary substances. The two elements *hydrogen* and *oxygen* may be taken as typical of the two classes of *basylous* and *chlorous* elements. The basylous function is generally performed by a metal, the chlorous by a non-metal; but the element which in certain combinations plays a decidedly basylous part may, when in combination with other substances, act the part of a chlorous element; thus, then, from a strictly chemical point of view, the characteristics of the class of metals are seen to be more or less relative. The properties which we have enumerated above are usually found in those substances to which we give the name of metal; but these properties vary very much in different metals. Conductivity for electricity is possessed by metals in a very special degree; they are also generally possessed of a peculiar lustre. The atomic weights of the metals vary greatly; their atomicities are also subject to great variations. In the following table are given the names, symbols, and atomic weights of the elements which are generally accepted as comprising the class of metals:—

NAME.	Symbol.	Atomic weight.	NAME.	Symbol.	Atomic Weight.
Aluminium,	Al.	27·4	Molybdenum,	Mo.	92
Antimony,	Sb.	122	Mercury,	Hg.	200
Arsenic,	As.	75	Nickel,	Ni.	59
Barium,	Ba.	137	Niobium,	Nb.	94
Bismuth,	Bi.	210	Osmium,	Os.	199·2
Cadmium,	Cd.	112	Palladium,	Pd.	106·6
Cesium,	Cs.	133	Platinum,	Pt.	197·4
Calcium,	Ca.	40	Potassium,	K.	39·1
Cerium,	Ce.	92	Rhodium,	Rh.	104·4
Chromium,	Cr.	52	Rubidium,	Rb.	85·4
Cobalt,	Co.	59	Ruthenium,	Ru.	104·4
Copper,	Cu.	63·4	Silver,	Ag.	107·93
Didymium,	Di.	96	Sodium,	Na.	23·04
Erbium,	Er.	112·6	Strontium,	Sr.	87·5
Gallium,	Ga.	69·86	Tantalum,	Ta.	182
Glucinum,	Gl.	14	Thallium,	Tl.	204
Gold,	Au.	197	Thorium,	Th.	231
Indium,	In.	113·7	Titanium,	Ti.	50
Iridium,	Ir.	198	Tin,	Sn.	118
Iron,	Fe.	56	Tungsten,	W	184
Lanthanum,	La	92·8	Uranium,	Ur.	120
Lithium,	Li.	7·02	Vanadium,	Vd.	51·4
Lead,	Pb.	207	Yttrium,	Y.	61·7
Magnesium,	Mg.	24	Zinc,	Zn.	65·2
Manganese,	Mn.	55	Zirconium,	Zr.	89·6

Several of these metals have been known for centuries, others have been discovered only within the most recent periods. As new methods of research

have been opened up the number of the metallic elements has increased; thus Davy, by taking advantage of the newly-discovered electric force, was able to resolve the alkalis potash and soda into simpler substances, and so to add the names of potassium and sodium to the list of metals. In late years the use of spectrum analysis has enabled the chemist to see new metals which had else remained unknown.

The metals are generally capable of combining with oxygen, sulphur, chlorine, bromine, or iodine, to form binary compounds; most of them form combinations with one another, to which the general name of alloys is given. For an account of metallic salts reference must be made to the articles on the various metals.

METAMERISM, the name given to a peculiar instance of the general phenomena of isomerism (which see).

METAMORPHISM (Gr. *meta*, denoting change, and *morphē*, form), a term now employed in geology to denote that process of change to which the deposits forming the earth's crust have been at some time subjected. Rocks that have undergone this change are known as *metamorphic rocks*, and the theory which attempts to account for the change has been designated by Sir Charles Lyell the *metamorphic theory*. Such rocks as gneiss, mica-schist, and statuary marble, all of aqueous or mechanical origin, have assumed the most highly crystalline state; and it is admitted by all geologists that their peculiar characteristics are due to a variety of modifying causes, which constitute what is termed *metamorphism*. What differences of opinion exist relate to the manner in which the changes have been brought about. The rocks most commonly spoken of as metamorphic are those in the *igneous* or *plutonic* condition. It can be demonstrated that fossiliferous formations of various eras, some older than the Cambrian strata, others contemporaneous with the Silurian, others belonging to the oolitic period, and some even of tertiary date, have been transformed into highly crystalline rocks. The two most probable agents in effecting this transmutation have been heat and pressure, aided by thermal water, or steam and other gases permeating the porous rocks, and giving rise to various chemical decompositions and new combinations; and to these agencies, acting at great depths, has been given the general term *plutonic*. Plutonic action is deemed of sufficient power to fuse even granite, and much more to superinduce the metamorphic texture upon the overlying sedimentary strata. Hence a twofold age may be assigned to each metamorphic formation; first, that in which it originated as an aqueous deposit; and second, that in which it acquired the crystalline texture. Therefore the metamorphic form of these strata may be comparatively modern, while the sedimentary form may have been of great antiquity. It does not seem that a very great degree of heat is necessary to produce crystallization, it being considered demonstrable that such a transformation must, in instances, have been superinduced at a temperature not higher than 94° Fahr.

METAMORPHOSIS. In zoology this term is applied to indicate the series of phenomena observed in the development of some animals, whereby the young form, on leaving the egg, differs more or less completely from the parent form, and only after passing through a series of *changes* assumes the likeness of its progenitors. To this series of changes, which may be very defined or on the other hand but faintly marked, the name of *metamorphosis* has been given. The occurrence of metamorphosis is by no means confined to the lowest groups of the animal series, for we find the Amphibian Vertebrates—as in the case of Frogs, Newts, and their allies—exemplifying these phenomena in a very striking manner. Amongst the *Protozoa* (Sponges, Animalcules, &c.) instances of metamorphosis occur; although the development of these forms has yet to be fully studied before a definite opinion can be formed as to the exact nature of protozoic changes. The *Cœlenterate* animals (Corals, Zoophytes, &c.) exhibit many interesting examples of metamorphoses, which present in some instances, remarkably complicated cycles of change. The metamorphoses of *Echinozoa* (Star-fishes, Sea-urchins, &c.) are also well marked, and have been very fully investigated; whilst those of the *Annulosa*, including the Insects, Crustaceans, Worms, &c., are among the most marked and familiar with which we are acquainted. In *Molluscs* several instances of metamorphoses occur; and in the Vertebrate sub-kingdom the Amphibians exemplify the process. The familiar example of the butterfly's development will give a good general idea of the process of metamorphosis. The egg of the butterfly gives origin to a crawling grub, caterpillar, or *larva*, as it is scientifically named. This larva (see LARVA) spends its life in eating voraciously, and devotes all its energies to the nutrition of its form. It possesses a structure entirely different from that of the perfect insect, is provided with a masticatory form of mouth; the body consists of thirteen joints, and possesses six front and several pairs of hinder legs; it casts its skin or moults several times to accommodate the increasing size of its body; and at length spins for itself by the aid of a 'spinneret,' a cocoon or 'pupa-case,' with which it invests its body. In this pupa-case it lies to outward appearance quiescent, as the *pupa* or second stage; and at the appropriate time, the form bursts from its cocoon, and emerges as the perfect, sexual, and mature insect, to which the distinctive name of *imago* has been applied. If we consider closely the nature of the changes which in this life-circle have been undergone by the insect, we may observe that the metamorphosis has been one not merely of outward form, but has involved deeper structures and parts also. Thus not only is the external form of the larva exchanged for that of the imago, but the internal structure of the caterpillar is entirely disintegrated, and as fully remodelled and constructed anew. The larva is thus asexual, whilst in the imago the reproductive organs become fully developed; the wingless larva appears in due time as the winged imago; and the limbs and muscular system similarly participate in the changes which characterize the development of the perfect form from its larval predecessor. Insects themselves exhibit many and varying degrees of perfection in their metamorphosis. The butterflies, bees, beetles, flies, &c., undergo changes essentially similar to that above described, and are hence known as *Heteromorphous* or *Holometabolic* insects. Others, such as the Grasshoppers, Locusts, Bugs, Dragonflies, undergo a less perfect series of changes, the larva more or less resembling the parent in form, and differing from it chiefly in size and in the non-development of wings. These latter are therefore termed *Hemimetabolic* or *Homomorphous* insects. And lastly, a few lower insects (for example Lice, Spring-tails, Bird-lice) do not pass through any metamorphosis whatever, but come from the egg in the same form and condition in which they pass their entire and adult existence. These last are the *Ametabolic* insects.

Among Cœlenterata, and typically in the case of Hydrozoa or Zoophytes, metamorphoses are to be observed; although in many cases these latter changes partake more of the nature of a purely *developmental* nature—involving the presence of different parts or *zoöids* of an organism—than of a true metamorphism in which a single form and its organs are alone involved. The same remark holds good of the Tœni-

ada or Tapeworms and their complicated developmental cycle, in which the embryo passes through a series of developments without undergoing much or any actual metamorphic change in itself. We would thus distinguish metamorphosis from those phenomena concerned with the production of an embryo, and with the phases of *development* through which that embryo passes. Metamorphosis proper is concerned less with the production of an embryo through development than with the production of a perfect being through changes in its form, and this after the purely embryonic stages are passed. In Echinodermata, on the contrary, we find examples of true metamorphosis. The young star-fish or sea-urchin appears first as a larval form, which is provided with an alimentary tract of its own, and a calcareous skeleton peculiar to itself. Soon, however, this larval body begins to show an involution of its substance; and within a mass of *blastema*, or primordial formative matter, the body of the future animal is gradually developed. The larval form may either contribute to the formation of the perfect animal thus evolved from its substance; or it may be discarded and thrown off when the perfect form is produced. In many Crustaceans well-marked metamorphoses are observed. In the Crabs metamorphic processes are thus seen; the larval Crab or *Zoea* possesses a long, flexible, jointed tail, which becomes shortened in the next stage (*Megalopa*), comparable to the pupa. And succeeding the Megalopa-stage we find the tail becoming rudimentary, and the crab assuming its adult form. Successive moultings accompany the various changes in the crabs. The Prawns also exhibit a metamorphosis, and many lower Crustacea pass through changes in their development more or less defined. Among Molluscs the Gasteropoda and Pteropoda exemplify classes in which metamorphosis is represented; and in Tunicates a corresponding series of phenomena has been described. In Amphibians, as in the Frog, the *larva* or *tadpole* is fish-like in form, destitute of limbs, and breathes by external gills. These are soon replaced by internal branchiæ; with the development of legs and with the disappearance of the tail and gills, changes which take place gradually, the lungs become developed; and finally the frog leaves the water and becomes a terrestrial and air-breathing animal.

Such are examples of metamorphosis, which is defined by Quatrefages to consist of changes which are 'undergone after exclusion from the egg, and which alter extensively the general form and mode of life of the individual;' a definition which expresses what is implied in the essential idea of metamorphosis, but which does not attempt to give any further information or clue as to the relations of the process with the organism as a whole. Recent theories, connected with the origin of living beings, have found in metamorphic phenomena a source of argumentative supply, which is utilized in support of the tenets upheld by these theories; and it is thus maintained that the metamorphosis of any form or series of forms indicates certain affinities with those beings to which it is most nearly allied in the chain of descent. Darwin thus says that 'the embryonal state of each species reproduces more or less completely the form and structure of its less modified progenitors.' Thus the young Crab or Zoea reproduces the prawn-like state which the evolutionist might conceive to be the primitive and derivative type of the Crabs; the latter forms having thus been derived from their long-tailed or Macrurous neighbours. Without entering into the evolutionist's view, it may be maintained as a general rule—dealing, it must be confessed, with the *result* rather than the *cause* of metamorphosis—that metamorphosis is best defined in those animals the eggs of which are extruded in a comparatively immature condition, and which contain no nutritive provision for the included embryo. Thus the nutrition of the embryo is provided for during its metamorphosis, which might thus be regarded as equivalent to a *nutritive development*. And we may add to this consideration that those forms, the circumstances of whose adult life are such that little or no provision is then made for nutrition, exemplify metamorphic phenomena in their most typical aspect. Thus the short-lived adult butterfly is solely concerned with reproduction; and hence nutrition, which forms no part of its *adult* functions, is performed in the longer larval stage. And lastly, it may be noted that those forms in which adult growth is of limited extent, as in the crabs—either from a short existence or from the hard exoskeleton preventing increase in size—generally present instances of minor metamorphoses exemplified in the moulting of the shells or hard external body-covering.

METAPHOR (Greek, *metaphora*, a transference), a figure of rhetoric, by which a word is transferred from the subject to which it properly belongs, and applied to another which it only resembles. The metaphor may be merely in an epithet, as 'winged haste,' or in the main subject of a sentence, as when a hero is called a *lion*, a minister a *pillar of the state*, &c. In respect to the points of comparison, the metaphor may either put something animate or intellectual for something inanimate and material; for instance, 'the wrath of the sea,' 'the bountiful earth,' to represent nature as if endowed with will; or, *vice versâ*, may substitute the physical for the spiritual, as, 'the stars of his merits will shine from the night of the grave.' Thirdly, a metaphor may consist in the transfer of a term from one thing to another, falling under the same great division of material or spiritual, but substituting the more familiar for the less, as when we speak of the 'silver moon.' Brevity and power are the characteristic excellencies of the metaphor; novelty shows the original wit. Unexpected contrast may produce an effect sublime or ridiculous in the highest degree. A slight consideration will show us how constantly we speak in metaphors, and that we convey most abstract ideas by metaphors of the second kind; thus, He is *cold* towards me, He is *large-minded*, &c. It is maintained by many that all language began by the designation of objects and actions affecting the senses, and that when the mind began to abstract man was obliged to use his stock of words for abstract ideas, so that all words, if we had the means to trace them, would be found to refer originally to things material, which it cannot be denied is often the case. This idea, first formally propounded by Locke, is now received as substantially correct by those most profoundly versed in philological science, who hold further that 'no advance was possible in the intellectual life of man without metaphor.' See Max Müller's Lectures on Language, second series, viii.

METAPHYSICS, a term originally employed to designate a treatise of Aristotle, but unknown to that philosopher himself. It seems to have been first used by Andronicus Rhodius, the original editor of Aristotle's collected works (B.C. 80), and indicates merely that the several essays on the first philosophy come *after the physical treatises* of the author (*ta meta ta phusika*). Sir James Mackintosh remarks that 'the term affords a specimen of all the faults which the name of a science can combine. To those who know only their own language it must, at their entrance on the study, convey no meaning. It points their attention to nothing. If they examine the language in which its parts are significant, they will be misled into the pernicious error of believing that it

seeks something more than the interpretation of nature.' In modern times the word, as employed by different authors, assumes distinct meanings. It was formerly appropriated to the ontology and pneumatology of the schools, but latterly it has been understood as applying to all inquiries which seek to trace the various branches of human knowledge to their first principles in the constitution of our nature. Aristotle's own definition is that it is the science which contemplates being as being, and the attributes which belong to it as such. This implies that things in general must be divided into beings, or things as they are, and into phenomena, or things as they appear. In modern usage metaphysics is very frequently held as applying to the former division, that is, to the ultimate grounds of being. To attain this end it takes account of the correlative of being, that is, knowledge; and of knowledge not as coming within the province of logic, or of mental philosophy, but as it is in relation to being or objective reality. In this aspect metaphysics is synonymous with ontology. The science has also by some been considered as synonymous with psychology, or the second division, and to denote that branch of philosophy which investigates the faculties, operations, and laws of the human mind. These two sciences, however, have been regarded as investigations of the same problem from different points of view, though the link connecting the contents of each has still to be pointed out. Regarding the science in the most general sense, Mansel proposes the definition:—'Metaphysics, or the philosophy of the facts of consciousness considered subjectively in relation to the mind knowing, and objectively in relation to the things known,' and thus dividing itself naturally into the two branches of psychology and ontology. On the other hand Ferrier, in his Institutes of Metaphysic, occupies himself solely with the questions connected with knowledge, or the nature of our perception of an external world. In his Kritik der reinen Vernunft Kant denies the possibility of a theoretical science of things beyond experience, and hence his claims as a metaphysician have been denied by some modern philosophers, by whom he is classed as a mere critic of the mental faculties. His followers, again, designate Spinoza, Leibnitz, Wolf, and others who assume that there are axioms applicable to a sphere beyond experience, as dogmatists. Prior to all metaphysical speculation, properly so called, it is necessary to establish the identity, or at least the necessary concurrence, of thought and feeling. It is this science of ultimate unity to which the greatest philosophers have assigned more or less distinctly the name of metaphysics. The different metaphysical schools may be ranged under three heads: (1) the *materialists*, of whom Hobbes, Locke, Berkeley, and Hume, differing widely from each other, but pursuing cognate trains of reasoning, may be taken as the British representatives; (2) the *eclecticists*, holding an intermediate place between the former and the German transcendentalists, represented by Reid, Dugald Stewart, and Dr. Brown; and (3) the *transcendentalists*, represented by Kant and his followers. Of the transcendental method, which seeks to found a philosophy of being above consciousness, Mansel says it will be generally rejected 'from a conviction of its utter inability to furnish any reliable or even intelligible results. All such theories are open to two fundamental objections; they cannot be communicated, and they cannot be verified.' The greatest name in modern metaphysical science is that of Sir William Hamilton, whose philosophy has been subjected to a searching criticism by J. S. Mill. See Dugald Stewart's First Preliminary Dissertation to the Encyclopædia Britannica; article Metaphysics in Encyclopædia Britannica, by L. Mansel; and Examination of Sir William Hamilton's Philosophy, by John Stuart Mill.

METASTASIO, Pietro Buonaventura, born at Rome in 1698. His true name was Trapassi, and his father was a common soldier. His poetical talents were early awakened, particularly by the reading of Tasso, and while yet a child were displayed in making rhymes and in improvisations: the latter, however, he was soon obliged to renounce, on account of his sensibility to nervous excitement. The celebrated Gravina, who accidentally became acquainted with his talents, took him under his protection, called him (by an Italianized translation of his name into Greek) *Metastasio*, paid great attention to his education, and on his death, in 1717, left him his whole estate. The young poet being thus placed in an easy condition devoted himself to his favourite study, and under the guidance of the celebrated singer Maria Romanina (afterwards Bulgarelli) in a manner created the modern Italian opera, though something had been previously done in this direction by Ottavio Rinuccini and Jacopo Peri. He had already produced an opera, Il Giustino, in his fourteenth year. In 1724 he began his career as a dramatic poet with the Didone abbandonata, which was brought out at Naples with Sarti's music, and in which he is thought to have depicted his own connection with Romanina. His success was such that Charles VI. invited him to Vienna in 1729, and appointed him poet laureate (*poeta cesareo*) with a pension of 4000 guilders. Thenceforward no gala took place at court which was not graced by his verses. Ferdinand VI. of Spain, who was delighted with his operas, in which Farinelli performed, sent the poet a flattering token of approbation. Metastasio constantly declined all the distinctions which Charles VI. and Maria Theresa were desirous to confer on him, and died at Vienna, 12th April, 1782. Pius VI., who was then at Vienna, visited him in person, and sent him his apostolical benediction *in articulo mortis*. The most important of Metastasio's works are his operas and musical cantatas, which have appeared in numerous editions. A ninth edition of his Opere dramatiche was published in Venice in 1748; a better edition is that of Turin (1757, fourteen vols.) His complete works, published in Venice (1781, sixteen vols.), contain his life. His Opere posthume appeared at Vienna (1795, three vols.) A compact edition, in one vol. 8vo, of his Opere complete was published at Florence in 1832. Metastasio's purity, clearness, elegance, and grace of style, the harmony, sweetness, ease, and expressive rhythm of his *arie*, canzonets, and songs, have rendered him a classic among the Italians. No poet, perhaps, has ever possessed in a higher degree the power of embracing the most essential circumstances of a poetical situation in a narrow compass. The songs with which his personages retire are almost always the most concise and natural expression of the state of the feelings. His representations of the passions are, however, general, and his pathos to some extent destitute of individual character. He is throughout musical, but seldom picturesque. His rhythmical forms are light and pleasing, but are frequently repeated with little variation, and throughout all his compositions there is much of mannerism. The gallantry of his heroes and the fondness of his heroines are, perhaps, less to be blamed than the choice of subjects whose serious character makes trifling out of place. His tragic attempts failed. His astonishing success through all Europe, and particularly at courts, was owing partly to his being not only in office but in manner a court poet. Brilliant and superficial, arraying prosaic thoughts in a poetical style, always preserving a courtly elegance, with a constant observance of the conventional proprieties of high life, he could not fail

to please in the courtly world. Few of his operas have maintained a place on the stage, on account of the change in the musical taste.

METATARSUS, the part of the foot popularly known as the 'instep,' and which corresponds to the 'palm' of the hand. It consists of five elongated bones, the first or innermost bone being shorter and thicker than the rest. Throughout the Vertebrate group, and even among mammals, the metatarsus undergoes great modification from its disposition in man. See FOOT, MAMMALIA, SKELETON, &c.

METAURO (anciently *Metaurus*), a river of Italy, in the Marches, which flows E.N.E. past St. Angelo in Vado, and falls into the Adriatic, S.S.E. Fano; total course, about 50 miles. The Romans under the consuls Claudius Nero and Livius Salinator gained near its banks a victory over the Carthaginians under Hasdrubal (B.C. 207).

METAYER (French, *moitié*, half), the name given in France to the cultivator of a *métairie* or farm who reserves for himself one portion of the produce as the price of his labour and gives the proprietor the other, which represents the rent of the land after deducting what is necessary to keep up the stock. The greater part of the centre and south of France, and almost the whole of Italy, is cultivated by metayers, who are in general upright, economical, and industrious, but ignorant, poor, unenterprising, and not disposed to adopt those systems of agricultural improvement which alone can fully develop the productive powers of the soil. It has, therefore, been keenly debated whether or not the suppression of this class of cultivators would be a national benefit. Arthur Young, who saw the results before the revolution, speaks unfavourably of them, while Jones, Sismondi, and J. S. Mill hold an opposite opinion.

METELLUS, the name of a distinguished family of the Cæcilia gens at Rome. Among the most distinguished members of the gens were QUINTUS CÆCILIUS METELLUS MACEDONICUS, who defeated the Achæans, took Thebes, and invaded Macedonia, &c., and received a triumph B.C. 146. Q. CÆCILIUS METELLUS NUMIDICUS rendered himself illustrious by his successes against Jugurtha, the Numidian king. He took, in this expedition, the celebrated Marius (see MARIUS) as his lieutenant, and soon had cause to repent of the confidence he had placed in him. Marius raised himself to power by defaming the character of his benefactor, and Metellus was recalled to Rome, and accused of extortion and ill-management. Marius was appointed his successor to finish the Numidian war, and Metellus was acquitted of the crimes laid to his charge before the tribunal of the Roman knights, who observed that the probity of his whole life and the greatness of his exploits were stronger proofs of his innocence than the most powerful arguments. He celebrated a triumph at Rome, B.C. 107. His son, Q. CÆCILIUS METELLUS, received the surname of *Pius* on account of the love which he displayed for his father when he besought the people to recall him from banishment in 99 B.C. In 83 B.C. he joined Sulla, with whom, three years later, he was united in the consulship. Q. CÆCILIUS METELLUS CRETICUS conquered Crete, and reduced it to a Roman province in 67 B.C. Q. CÆCILIUS METELLUS PIUS SCIPIO was the adopted son of Metellus Pius. In 52 B.C. he was colleague in the consulship with Pompey, who had married his daughter Cornelia. Hence he exerted himself to the utmost to destroy the power of Cæsar and strengthen that of his son-in-law. He commanded the centre of Pompey's army at the battle of Pharsalia, and thereafter fleeing to Africa was defeated by Cæsar at Thapsus (B.C. 46). He died by his own hand.

METEMPSYCHOSIS (Greek, from *meta*, beyond; *en*, in; and *psychoō*, I animate), transmigration; the passage of the soul from one body to another. See TRANSMIGRATION OF THE SOUL.

METEOR, a name originally given to any atmospheric phenomenon; it is now more usually applied to luminous meteors or meteoric stones (which see).

METEORIC IRON. See IRON (NATIVE), and METEORIC STONES.

METEORIC STONES, bodies which visit the earth from interplanetary space, and termed shooting-stars, fire-balls or detonating meteors and aerolites. They more usually make their appearance as stars, sweeping across the heavens, and disappearing; but they sometimes follow crooked paths, leaving behind them trains of luminous vapour, or fall to the earth, or divide into two or more masses, or burst into fragments with loud explosion. Aerolites, or meteors which fall to the earth, are found to consist of known chemical elements; they are usually composed of metallic iron and certain silicates, such as olivine and augite. They all exhibit indications of having been fused. Meteoric stones are known to pass through the atmosphere in the daytime, but their light is too feeble to render them visible to us.

Observation shows that shooting-stars and fire-balls are not of electric or other purely atmospheric origin, and that it is not possible for meteoric stones to have been ejected from terrestrial or lunar volcanoes, theories which were once supported. In fact, it is now generally believed that the phenomena of meteoric stones are due to the existence of a great number of bodies, some of them very small indeed, which revolve round the sun, and which when they happen to pass through the earth's atmosphere are intensely heated by friction, and become luminous. In August and November every year exceptionally great numbers of shooting-stars make their appearance; and in these star-showers it is observed that all the meteors appear to proceed from one part of the heavens, from which they seem to spread out as from a radiant point. The November star-showers exhibit a well-marked periodicity of splendour; the maximum brilliancy occurs every thirty-three years, and then sometimes for four years in succession there are showers of unusual magnitude. It is now generally understood that a star-shower is due to the existence of a dense elliptic ring of small bodies, which is cut by the earth's orbit; a certain length of the ring is much denser than the rest, and a shower of great brilliancy results from the earth passing through the dense part of the ring. The ring through which the earth passes every year in November revolves round the sun in 33¼ years; its dense portion requires a number of years to pass through that part of the orbit where it is cut by the earth's orbit. As to the identity of meteoric stones with comets, and the phenomenon known as the zodiacal light, see the separate articles under these heads.

METEOROLOGY treats of atmospheric phenomena relating to weather and climate. The leading facts and inferences regarding the appearances which precede change of weather are found incorporated in all languages. Aristotle collected popular prognostics, and the work of his pupil Theophrastus contains nearly all that was known about the weather down to comparatively recent times. Exact observations began to be made on the pressure of the atmosphere after 1643, when Torricelli invented the barometer; on the temperature of the air after 1714, when Fahrenheit invented the mercurial thermometer; and on the dryness of the air when De Saussure invented the hygrometer. These instruments enabled many observers to gather a large body of facts in many parts of the world, and the discoveries of physicists are enabling us more and more to make use of these facts in the determination of the laws of meteorology.

Hadley in 1735 propounded a theory of the trade-winds, and Dalton in 1793 published acute explanations grounded on the laws of physics of the phenomena of winds, rain, clouds, &c., in relation to the temperature of the air. The Theory of Dew published by Dr. Wells in 1814 must always be regarded as one of the greatest contributions made to meteorology. Dalton published his Meteorological Essays and Observations in 1823; he had paid particular attention to the hygrometric state of the atmosphere; this department of meteorology is regarded as being of the utmost importance, but it has not as yet been studied with great practical results. Dové's continuation of Humboldt's investigation of isothermal lines on the surface of the earth and the establishment of meteorological observatories in the United States and other countries, with the continuous publication of charts of temperature and rainfall, have already led to striking results, and promise much for the future. We shall speak presently of the exact character of the information conveyed by charts of atmospheric pressure. We may mention some of the more important problems which exact systematic observation of the dryness and temperature of the atmosphere may be expected to answer:—the influence of difference of temperature between two places in causing storms and unsettled weather; the cause of the peculiar falls and rises in temperature observed at any place at certain particular times of the year; the influence of dryness and temperature on the growth of crops and on the health of the people of a country, and the causes of excessive rainfall and floods in rivers. Observation shows that in the north temperate zone storms nearly always move eastward; thus in the United States a storm may be preceded in its march by the telegraph so that ports on the eastern coast can always get timely warning of its approach. This system of warning is inapplicable to the west coast of Europe, but it has been observed that a storm is always preceded by a fall of the barometer, and the tendency to fall is observed some time before the minimum depression occurs; the notice of this tendency, together with observations of the wind and motions of cirrus clouds, enables storm warnings to be sent from observatories to the ports of the United Kingdom. The late Admiral Fitzroy was the discoverer of this method of storm warning, which has now been adopted by almost every European country. For future investigation of weather phenomena good materials are furnished by certain regularly published observations, and particularly by the Bulletin International of Leverrier, which shows graphically the atmospheric pressure and the direction and force of the wind each morning over the Continent. It may be suggested that more observers are much wanted. The missionaries who are in Pacific Islands might with great ease get timely warning of storms coming to their coasts. Making meteorological observations and keeping registers of them forms part of the common school education in America, but it has not to any extent been brought into notice in English schools. Readers will find descriptions of the ordinary observatory instruments in the articles BAROMETER, THERMOMETER, HYGROMETER, RAIN-GAUGE, MAXIMUM THERMOMETER, MINIMUM THERMOMETER. Barometer observations have to be corrected for temperature and height above the sea-level. For the generally adopted methods of correction by means of tables, and for a detailed account of the use of meteorological instruments generally, see Mr. Buchan's Handy-Book of Meteorology.

In placing thermometers for determining the temperature of the air it is necessary to avoid direct and reflected radiation from the sun and terrestrial bodies near, to have as free circulation of air about the instruments as is possible, and to have them at the same height from the ground as in all other similar observatories. This last condition is of great importance, as the temperature of the atmosphere in calm weather is very different at different heights. It is usual to place the instruments in a wooden box, with louvre-board sides painted white, the bulb of the minimum thermometer being 4 feet above the ground. The box is placed in an open space over old grass to which the sun has free access during the greater part of the day. At the Belfast meeting of the British Association (1874) Mr. Negretti exhibited a thermometer which registers the temperature at any particular hour of the day or night. Half the stem is bent back towards the bulb; there is a contraction in the tube near the bulb; if at any time the instrument is turned completely round, the mercury column detaches itself at the contraction and passes beyond the bend in the stem, and its length may be read off. The reading may be made at any time, it indicates the temperature of the instant of turning. An ordinary alarm-clock will turn the shaft to which a thermometer of this kind is fastened at any specified time; indeed, twenty-four thermometers fixed on the same number of shafts may be caused to turn each at a particular hour, so that an observer has merely to examine and set them all at any time he pleases every day. Mr. Negretti has designed an instrument for observing deep-sea temperatures. The bulb of one of the above-mentioned thermometers is inclosed in a strong glass case containing air and alcohol; the instrument is attached to a shaft on a framework on which there is a water screw; this screw turns when the frame is lowered or drawn up in the water, but it cannot turn the thermometer when it is sinking, and it can only give it one turn when being drawn up, consequently the thermometer indicates the temperature of the water at a very short distance from the lowest point to which it sank. An *anemometer* may (1) measure the velocity of the wind when it consists of four hemispherical cups screwed on the ends of two horizontal rods crossing each other at right angles and turning freely a vertical shaft whose rate of revolution is registered by a screw and a train of wheels; this registration may be marked continuously on a moving sheet of paper with the direction of the wind at every instant: it may (2) measure the pressure of the wind by presenting to it the surface of a metal plate and indicating the force by means of a spring or in other ways. The instruments used in observing variations in the earth's magnetism are described in the articles MAGNETISM (TERRESTRIAL), MAGNETOMETER. The presence of electricity can always be detected in the atmosphere; in fine weather this is usually positive electricity, but in showery or stormy weather the indications are generally much stronger, and the air is found to be negative as frequently as positive. One method of obtaining indications was by shooting up an arrow attached by a long conducting thread to a ring on the top of a gold-leaf electroscope; the gold leaves diverged more and more as the arrow went up, and they remained apart when the ring was lifted from the electroscope by the arrow. Another method was to have a long vertical pointed rod attached to the electroscope, and this was improved by fastening to the end of the rod a burning match; the smoke from a match is very effective in bringing the electroscope and the air at the match to the same state of electrification or electric potential. Sir William Thomson's water-dropper is a water-can connected with an electrometer and insulated from tables, &c.; from the can there proceeds a tube to the outside atmosphere; drops of water falling from the end of the tube are very effective in bringing the electro-

meter to the same potential as that of the air at the end of the tube. The amount of azone (which see) in the atmosphere at any time may be roughly measured by exposing Shonbein's test-papers in the thermometer box. Observations of rainbows (which see) and halos (which see) hold a subordinate position in meteorology; the colours of clouds and the polarized light of the atmosphere are of more importance. Red and golden clouds, 'the day's dying glory,' exhibit the dissolution of cumulous clouds in a warm atmosphere, and may be regarded as prognostics of fine weather. Thin white or gray cirro-cumulous clouds, appearing before sunrise high in the eastern sky, indicate condensation and re-vaporization in ascending air currents; they herald the appearance of cumulous clouds and fine weather. A green or yellowish green sky is a sure prognostic of rain in summer or snow in winter. If a yellow-tinted evening sky after stormy weather becomes greenish, more rain and stormy weather may be expected; if it deepen into red the air is getting drier and fine weather may be looked for. The polarized light of the atmosphere is likely to become important in meteorology in telling of the vapour of the upper regions and the approach of storms and rain, when the law of its modification by the presence of aqueous vapour is better known. Hygrometric observations ought to be made in different parts of the same town during an east wind, and temperatures observed when the weather is considered hurtful or beneficial to particular diseases; at the same time physicians ought to note the commencement, culmination, and cessation of particular diseases in their districts; this is the proper direction for prosecuting an inquiry into local climate.

We will now consider barometric observations. Variations of the barometer may be distinguished as periodic or irregular. Of periodic variations the *daily* variation is very remarkable in the tropics; Humboldt says that the time of day may be ascertained without much inaccuracy from the barometric height. This daily variation is masked in Great Britain by irregular variations, unless the means of a great many observations are considered. There seems therefore to be, as was to have been expected, a connection between the height of the barometer and the variation of temperature during the day; it is to be remembered that heat not only rarefies the atmosphere, but it produces a rapid evaporation from the ground, which may be shown to increase for the time the barometric height. On the whole, the daily barometric range is found to decrease towards the poles, showing the influence of the sun's heating power. Perhaps there is no daily variation in places near the poles, where there is no alternation of day and night. There is a great difference in the daily range in winter and summer, except in wet climates. The *annual* barometric variation is due to its being summer in one hemisphere when it is winter in the other; the air becomes rarer in the warm regions, and denser in the cold, but at the same time there is an increase of pressure due to rapid evaporation in the warm land regions. A comparison of a chart showing the *isobarometric* (which see) lines of mean pressure for July, with another for January, will sufficiently indicate the amount of the annual variation. In the tropics there is nearly the same amount of heat and evaporation at all times in the year, so that the mean monthly height of the barometer is nearly always the same; at Irkutsk, in Siberia, there is no great variation in the moisture of the atmosphere, but its temperature varies greatly, hence there is a very considerable increase in its pressure in winter. We cannot enter into proofs of the influence of temperature and moisture on the pressure of the atmosphere; suffice it to say, that the mapping of mean monthly isobarometric lines has already led to much in explaining the phenomena of prevalent winds and rainfall over the world, and is expected to lead to satisfactory solutions of these and other important problems. Mr. Buchan has, with praiseworthy care, mapped, from what published observations for a number of years he could find, the mean monthly isobarometric lines of the world. In the chart for July he finds the lower pressures to be distributed over the continents, the greater land areas having the lower pressures; the higher pressures are distributed over the ocean from 50° N. to 50° S. lat., the pressure being highest in those parts of the ocean most inclosed by land. He remarks that the pressure is below the average throughout the year in the regions surrounding the poles. Such charts enable us to apply the laws of physics in explaining phenomena. When solar heat falls on land the surface is immediately warmed; as this heat cannot descend quickly into the ground by conduction, the air at the surface becomes warmer, expands, and rises, so that there tends to be a higher ocean of air over warm than over cold surfaces; the upper parts of this ocean are compelled to flow to cold regions, so that the atmospheric pressure is lessened in warm, and increased in cold regions. Now when solar heat falls on the sea the surface can never rise high in temperature because of the continuous motion of water particles, and besides, water has a very high specific heat (which see), hence the surface water of the ocean at any place is nearly always at the same temperature, being cooler in summer and warmer in winter than neighbouring lands. The atmosphere over an ocean is cooler in summer than neighbouring lands, and therefore receives the overflowing air from the land, so that seas in summer are regions of high pressure, and this the more as they are more surrounded by land. It is to be remembered that moist air is lighter than dry air, so that moist air currents ascend and create a lowering of pressure at any place by overflowing into other regions (this explains the low pressures in oceans near the poles; the effect must not be confounded with the temporary increase of pressure produced by rapid evaporation from land surfaces); moreover, when currents of air ascend they expand, and therefore become cooler, so that their moisture condenses into rain. From an examination of charts of mean annual pressure, it has been concluded that the aqueous vapour of the atmosphere calls into play disturbing atmospheric forces of the most important nature. (See also HYGROMETER, CLOUD, RAIN, FOG, SNOW, HAIL.) Much of the solar heat is stopped by the moisture of the atmosphere. Observations show that the intensity of received solar heat increases from the equator to the poles, and also with height above the sea-level. Badly conducting surfaces have the greatest influence on the temperature of the air in summer. On this account, and also from there being no heat expended in carrying on vegetation, the sandy deserts of the tropics may have surface temperatures of 120°, 140°, or even 200° Fahr. Surfaces of rock are raised less in temperature than loam and clay, and these less than the surfaces of sandy soils. Vegetation lowers the surface temperature for the reason mentioned above, and also because a plant exposes a very considerable surface to the air. Forests tend to make the air warmer at night and cooler in the day; they lead to slower evaporation from the ground, and perhaps increase the humidity of the atmosphere by preventing the rapid escape of moist air. Forests must lower the summer and raise the winter temperature of a district; it is easy to see that this increases the summer rainfall

The greatest difference between the temperature of the soil and that of the air occurs when the ground is covered for some months of the year with snow. Snow is a bad conductor, and it prevents the propagation of heat from the soil. Variations of temperature depending on the hour of the day are scarcely sensible in any ground at lower depths than 2 or 3 feet, and those depending on the time of the year decrease gradually as the depth increases, so that the annual range at the depth of 25 feet is not more than 3° Fah. (For the observations and laws of terrestrial conduction, from which Sir William Thomson deduced the temperature history of the earth, readers are referred to Everett's Natural Philosophy, part ii., and a number of committee reports of the British Association.) We have already referred to the behaviour of a sea in receiving solar heat; the received heat is diffused through a considerable depth of the water near the surface; the specific heat of water is great; to these causes are due the enormous effects of oceans and inland seas in modifying climate. The amount of solar heat falling on the ground may be observed by means of maximum thermometers with blackened bulbs inclosed in thin glass tubes hermetically sealed. The temperature of the surface of the ground may be observed by means of maximum and minimum black-bulb thermometers laid horizontally just over short grass, in such positions that the sun and air have free access to them. Attempts have been made to observe terrestrial radiation, but there is as yet no satisfactory method of observation. (The article on DEW may here be referred to by readers.) In cold calm weather and on a calm night the temperature of the atmosphere is found to increase with the height, for the cold air sinks to the lower levels; Mr. Glaisher once observed a difference of 25° Fahr. between two thermometers, one placed on raw wool over long grass, the other at a height of 4 feet. The rate of increase of temperature with height is greatly modified by the configuration of the surface of the earth; it is easy to see why places on rising grounds are never exposed like low-lying places to the full intensity of frosts; this modification of temperature by the configuration of the ground is well shown in the published observations from places in Switzerland.

The distribution of temperature on the earth is usually shown by means of isothermal lines (which see); these lines would correspond with parallels of latitude were it not for certain disturbing causes, the currents of the sea, large water surfaces which are frozen during part of the year, the unequal distribution of land and water, the prevailing winds and mountain ranges. Charts of temperature, when carefully examined, show satisfactorily the influence of these causes. (See Buchan's Handy Book.) Isothermal lines show by their peculiarities at certain places the winds, humidity, &c., which affected those places. The mean temperature of a place is found not to increase regularly from January to July, and then to decrease. There are certain well-defined periods of interruption. Careful examination has shown that these interruptions are in a great measure due to certain periodic changes in the distribution of atmospheric pressure, in fact to the periodic peculiarities of winds. The strength or velocity of a wind is measured by means of an anemometer, described above. On a map the direction of a wind may be given by means of an arrow, and its strength by the number of lines (there may be as many as six lines) representing the feather of the arrow. When the wind is marked on a chart along with isobarometric lines, it is seen that the wind, and hence the rainfall, depends on the pressure, and therefore on the temperature and humidity of the atmosphere. The winds are approximately known from the isobarometric lines, the direction of the wind being from regions of high to regions of low pressure (subject to the changes produced by the earth's rotation, &c.), and the velocity being indicated by the proximity of the lines on the chart. To explain the land and sea breezes, the monsoons of the Indian Ocean, the trade-winds, and other prevailing winds, we have only to apply the principles given above, remembering that the earth rotates on its axis, and also that winds on the earth are affected by centrifugal force. Variable winds are affected by local causes: the nature of the ground, covered with vegetation or barren; the physical configuration of the surface, whether level or mountainous; the vicinity of seas and lakes. These local causes have more influence on wind in temperate than in tropical regions. All winds are to some extent influenced by the earth's rotation, and it is easy to show that any wind veers to the right hand as it advances. Now when a sudden diminution of pressure occurs in any region, it sets in motion the air in surrounding regions, every stream of air veers to the right, so that all the streams really blow in directions tangential to a closed curve. This is the explanation of cyclones. Inside the closed curve the pressure remains low for some time, a fact which is not explainable by centrifugal force. Now as this space is receiving streams of air we must believe that from it there proceeds a vast ascending current of air. The cause of the ascending current is found in the humidity and warmth which are known to prevail in the front and central parts of storms. The nature of the regions over which winds have passed gives them their characters of dryness or wetness, warmth or coldness. These effects are intensified in some parts of the earth, and cause excessive drought, heavy rains, great heat or cold. (See CLIMATE.) We cannot here enter into the causes of this kind which give their peculiar characters to the simoon of Africa and Arabia, the solana of Spain, the harmattan of Guinea, the pampero of Buenos Ayres, the nortes of the Gulf of Mexico, the bora of the Adriatic, the levanter, and others. To design a theory of storms which would account for all observed phenomena is a very difficult problem: it must account for all the forms of storm areas or closed curves spoken of above, from the circle to the trough-like ellipse; for the direction in which they move, and the changes in this direction; and for the great humidity of the atmosphere, often over extensive regions, which is a regular precursor of storms. We know little or nothing as yet of the specific conditions which originate great atmospheric disturbances, and to acquire this knowledge there must be an extension of the field of meteorological observation. The present state of our knowledge may be thus put: Given in any locality an excess or diminution of atmospheric pressure, temperature, or moisture, we know the atmospheric changes which will take place in restoring the equilibrium thus disturbed, and can to a considerable extent turn this knowledge to account in predicting the weather. We know that the different parts of Europe have an absolute dependence on one another; vast waves of temperature creep over the Continent, only a fragment of a wave being exhibited by the whole Continent at one time; when the pressure in the north of Europe is generally low, then the winds over the whole Continent become southerly, accompanied with a general rise of temperature; when the pressure in the north is high and in the south low, northerly currents and low temperatures prevail; when the pressure in the west is generally low, but high in the east, then easterly winds prevail, and the temperature rises or falls according to the season;

when the pressure in the east is diminished, then westerly winds prevail; and finally, when the pressure is low over some contracted space, such as the British Islands, then winds flow in upon it from all sides, giving rise to an extensive whirl in the atmosphere over that region, as the winds turn round and in upon the centre of least pressure. (See Buchan's Handy Book.) It is perhaps necessary for us to say that no prediction of the weather can be made, at least in the British Islands, for more than three days beforehand; but guesses or surmises may be formed for months beforehand which are not without value. Predictions based on planetal and other astronomical causes are for the most part, if not misleading, at least useless; but Dr. W. W. Hunter, director-general of statistics to the government of India, in dealing with statistics collected from 1812 downwards, has shown that the rainfall of Southern India increases with the increase of the sun-spots and reversely; and that the period of greatest drought and famine in that region occurs at intervals of about eleven years coincident with the period of least solar maculation or greatest incandescence. We have already spoken of the interruptions which occur in the regular march of temperature in the course of the year. Thus in the British Islands cold prevails about the second week of the months of February, April, May, August, and November, and in the end of June; and heat in the second week of July and August, and in the beginning of December. These interruptions of temperature are either preceded or followed by stormy weather. If, after an unusual prevalence of south-west wind, or the equatorial current, the polar current or north-west wind should set in, it is probable that easterly winds will prevail for some time. In winter frost, and perhaps snow, may be looked for; in summer the weather will become dry, warm, and bracing, particularly if the wind be east or south-east. If easterly winds have predominated in autumn, and south-westerly winds begin to prevail in the end of November or beginning of December, the weather is likely to continue exceptionally mild (known as St. Martin's summer), with frequent storms of wind and rain, till about Christmas. If easterly winds largely preponderate in spring, the summer is likely to be characterized by south-westerly winds, with much rain and moisture and little sunshine. When there is the average barometric height in Europe the upper atmospheric current in Great Britain is generally from north-west to south-east; hence when the cirrus cloud stretches from north-west to south-east we know that the atmospheric pressure is of the normal amount, and therefore look for settled weather; when the cirrus stretches from south-west to north-east we see the indication of stormy weather. The south-east wind, when rightly understood, is a most valuable weather prognostic in Great Britain. When it is moist and warm, and the sky is clear down to the horizon, or is streaked with cirrus and then covered with rain-clouds, we may expect stormy weather. When it comes in dry weather, with a clear sky hazy near the horizon, and a high barometer still rising or stationary, we may expect settled fine weather. One of the surest signs of the breaking up of a frost is the setting in of a north-east wind, accompanied by a falling barometer and a greenish or yellow-greenish sky, and particularly if the wind veers from north-east to north and north-west. It is accompanied by a fall of snow, which passes into sleet and rain as the wind shifts to the west. If with the north-east wind there is a clear sky, hazy near the horizon, and a high barometer rising or stationary, and if the wind does not increase in strength, and tends rather to veer into the east and south-east, the weather will remain settled for some time.

In tropical countries an observer may with certainty predict gales and hurricanes from very slight deviations from the average of the hour and season in pressure, direction, and strength of wind, and the direction and amount of cloud. In regions such as Great Britain an isolated observer cannot with a like certainty draw conclusions from his own observations, but he may almost attain to the same degree of certainty if he is in telegraphic communication with a sufficient staff of observers well distributed over Western Europe. Reference has been here already made to Admiral Fitzroy's method of storm-warning in Great Britain. In the United States the signal service of the army is principally engaged in meteorological observations, when not engaged in war. The officers and men transmit intelligence in regard to storms or other changes of weather by the display of warning signals and by reports at the different cities and ports of the Union. Maps showing the weather conditions are displayed at offices of the board of trade, and other public places. Bulletins of data are also furnished to the leading newspapers. Signal stations are also established in connection with life-saving stations, which intercommunicate by telegraph, and in addition to displaying storm signals, and making the ordinary meteorological reports, have to make special reports on tempests at sea, currents, temperatures, &c.

METHANE, the systematic name for marsh-gas. See MARSH-GAS.

METHODISTS, a name first applied by a student of Christ Church to John and Charles Wesley, and some other young men at Oxford, who were in the habit of meeting together, in 1729, for the purpose of strengthening each other's pious resolutions, and engaging in religious conversation. They aimed particularly at a more rigid compliance with the precepts of the New Testament than usual in the Establishment, and devoted themselves to works of love, such as instructing poor children, visiting the prisons, &c. On account of their methodical observance of the rules of religion and the regularity of their lives they were nicknamed the 'Holy Club,' and afterwards, as stated above, 'The Methodists,' a name which has adhered to them, and which they have adopted, though Wesley himself wished that the name might never be mentioned, but be buried in oblivion. Of the members of this small society the principal were John Wesley (see WESLEY), the founder, his brother Charles, and George Whitfield (see WHITFIELD), who joined it in 1735. In 1735 Wesley went out to Georgia, to engage in the conversion of the heathen. There he remained two years, and becoming acquainted with some of the Moravian Brothers, was much struck with their severe simplicity and pious devotion. (See UNITED BRETHREN.) He then visited Herrnhut, and after his return to England collected a small society in London, which held its conferences in a private house, without any disposition, at this time, to secede from the church. This Wesley himself calls 'the first Methodist Society,' and in it the germ and first beginnings of Methodism are to be found. He was driven to what may be called irregular proceedings by the clergy of the Establishment having refused their pulpits to the Methodist preachers. The concourse of auditors being too great to be accommodated in any church, they began to preach in the open air, and to organize a separate church on the presumed apostolical model. The peculiar character of this field-preaching, which was distinguished from the philosophical indifference of that of the Established clergy by its vehemence, religious enthusiasm, and popular style, and which dwelt more on the fall and depravity of man, on the atonement,

on the restoration through the merits of a crucified Saviour, on repentance, and on regeneration, with all the eloquence which a sincere zeal could inspire, had a great effect in increasing the numbers of the society. Whitfield, the boldest and most zealous apostle of Methodism, in eloquence, courage, and fire the Paul of his sect, often collected hearers to the number of 12,000 in the fields, churchyards, and even at fairs, and by the thunders of his eloquence and the terrors of his denunciations, produced such an effect upon his audience that many of them were turned to faith and holiness on the spot. These sudden conversions were considered as the outpourings of grace, and came to be considered by the Methodists as desirable results of their preaching. They soon gave up the practice of field-preaching, and built houses of worship (tabernacles), partly to protect themselves from exposure to the weather, and partly to avoid the outrages which they experienced from the rabble. Although they suffered much from the violence of the populace, yet, as the government made no opposition, they now proceeded to the regular establishment of their church constitution, Wesley feeling that a more definite and extensive organization than he had first given them was now imperatively demanded. The first conference, therefore, was held in 1744. It was composed of six clergymen, who proceeded to the consideration of the three topics—What to teach; How to teach; and What to do? The first two days were occupied with the discussion of several doctrines, evangelical and Arminian, which were defined with precision. On the three following days they discussed the relations of the 'Methodist Societies' to the Established Church, and secession from it was discountenanced. In a second conference held five years later Methodism took an organic and definite form, as Wesley's opinions regarding 'church order' had undergone a great and material change. An annual conference was now instituted, and class-meetings and love-feasts sanctioned. Methodism had henceforth its ministers, lay preachers, leaders, trustees, and stewards. The empire was divided into circuits for ministerial labour, for which there was an available ministerial force of about seventy men. From this date till 1791, when Wesley died, Methodism gradually diverged from the Church of England, and became entirely independent of it. It is now a distinct religious body, governed by an annual conference, having at its head a president and secretary, whose term of office lasts but for a year. In each district the ministers hold half-yearly meetings, the several chairmen being appointed by the conference. There are also quarterly circuit meetings of ministers and lay officers. The supreme legislative and judicial power is vested in the conference, to which the half-yearly and quarterly district and circuit meetings are subordinated. The number of members at Wesley's death was 76,968; but the denomination has increased with such marvellous rapidity that in 1883 there are said to be in different parts of the world 15,000,000 adherents. In their religious services the Methodists use the liturgy of the Established Church, with some alterations. It appears that the offices for the ordination of priests and deacons, and for the consecration of bishops, are altered into forms for the ordination of deacons, elders, and superintendents; the thirty-nine articles are, by omissions, reduced to twenty-five; the Nicene and Athanasian creeds are rejected, the apostles' creed only being retained; and the apocryphal books of the Old Testament are rejected. The most important of the various sects that have seceded from the original Wesleyans are: 1. The *New Connection*, as it is called, which arose in 1797 out of a separation from the Wesleyan establishment on grounds of church government and discipline. The leader in the secession was the Rev. Alexander Kilham. 2. The *Primitive Methodists*, originated in Staffordshire in 1810. Their leader was Hugh Bourne, and they are the most numerous of the sects that have gone off from the original body. 3. The *Bible Christians*, founded in 1815 by a Cornish lay preacher, are found chiefly in the west of England. 4. The *United Methodist Free Churches* are an amalgamation of three different secessions—the Protestant Methodist Association, formed in 1828; the Wesleyan Methodist Association, which dated from 1834; and the Wesleyan Reform Association, founded in 1849. The union was consummated in 1857. 5. The *Wesleyan Reform Union*, which consists of those who seceded during the agitation in the Wesleyan societies in 1849, but refused to amalgamate with the United Methodist Free Churches. The society of the Wesleyan Methodists in the United States of America is known as the Methodist Episcopal Church. Its members of the Wesleyan body first established themselves in New York in 1766. In 1784, after the war of Independence, the necessity of the formation of an independent society having been recognized, Wesley set apart and ordained a bishop for the infant church, who presented his credentials at the conference held at Baltimore, December 25 of the same year. Wesley granted to the bishop, his coadjutor, and the other preachers, permission to organize a separate and independent church. In 1830 those who were dissatisfied with the episcopal form of church government seceded and formed a new organization called the Methodist Protestant Church. A dispute on the slave question caused a second secession in 1843, named the Wesleyan Methodist Connection of America, followed next year by a much larger secession on the same question. This took the name of the Methodist Episcopal Church, South. The Welsh Calvinistic Methodists do not constitute a secession from the followers of Wesley. They originated partly in the preaching of Whitfield, who was a Calvinist, and partly in that of Howel Harris, a Welsh clergyman of the Church of England. This body was not thoroughly organized as a separate society till the beginning of this century. The Wesleyan Methodists have two theological colleges for training ministers—one at Richmond Hill, Surrey; and the other at Didsbury, South Lancashire. In the matters of church government and discipline the Methodists have adopted a system which seems to approach nearer to Presbytery than to any other polity. The distinctive character of Methodism is to be sought for not so much in its doctrines as in the application of them, which it endeavours to make for the purpose of producing strong excitement; and those whom it has awakened to a sense of their sins it subjects to a course of discipline intended to unite them closely with the connection. The fruits of Whitfield's preaching were, perhaps, not less than those of Wesley's, his followers being about as numerous in England as those of the great patriarch of Methodism. The rise of Methodism, though it was, perhaps, inevitably attended with some irregularities and extravagances, was a revival of religion in England. Since the Reformation there had been no such efforts made in the cause of religion; no preaching so awakening, so little sectarian; no preachers with more zeal, singleness of purpose, and power of exhortation. It awoke the slumbering church from its lukewarmness, and dissenters to more bold and united efforts of Christian zeal. It addressed the ignorant, the poor, the hardened, in such a manner as to interest their feelings and command their attention. It has done, and is doing, much to instruct as well as to excite them,

METHYL AND ITS DERIVATIVES. This name is given to the hypothetical radicle CH_3, supposed to exist in methylic alcohol, and in very many other carbon compounds. Methyl forms the first of the series of alcohol radicles, the general formula of which is C_nH_{2n+1}. In the year 1848 *Frankland* and *Kolbe*, by the action of potassium on ethyl cyanide, obtained a gas the composition of which agreed with the formula C_2H_6; now such a body may be regarded either as (1) ethyl hydride $C_2H_5.H$, or (2) as two atoms of methyl linked together to form one molecule.

$$\begin{matrix} CH_3 \\ | \\ CH_3 \end{matrix}$$

For a considerable time the new substance was supposed to be free methyl, that is—

$$\begin{matrix} CH_3 \\ | \\ CH_3 \end{matrix}$$

and to be isomeric, but not identical with ethyl hydride $C_2H_5.H$.

According to the generally received views concerning atomicity (see CHEMISTRY) such a body as CH_3 could not exist in the free state; it was therefore in keeping with chemical theory to believe that in the moment of its liberation the atoms of this substance should combine together in pairs to form the stable molecule—

$$\begin{matrix} CH_3 \\ | \\ CH_3 \end{matrix}$$

A few years later Frankland succeeded in preparing the same body by the action of zinc on methyl iodide, $Zn + 2\,CH_3I = ZnI_2 + 2\,CH_3$. Frankland compared the action of chlorine on this supposed $2\,CH_3$ with the action of the same gas on the so-called ethyl hydride ($C_2H_5.H$), and concluded that the two bodies were not identical. Schorlemmer has, however, studied this action of chlorine more carefully, and he finds that the resultant substances are the same in each case. The reactions which take place between equal volumes of chlorine and of the gas C_2H_6 may be thus formulated—

(1.) $C_2H_6 + Cl_2 = C_2H_5Cl + HCl.$
(2.) $C_2H_5Cl + Cl_2 = C_2H_4Cl_2 + HCl.$

The first reaction is the principal one; small quantities of the body $C_2H_4Cl_2$ (dichloro-ethane) are, however, always formed. The identity of the two substances formerly known as free methyl and ethyl hydride has been thus proved, so that we now know only of one body having the formula C_2H_6, to this substance the name of ethane is given, it forms the second hydrocarbon in the marsh-gas, or C_nH_{2n+2} series. (See MARSH-GAS.) From these considerations it is evident that the radicle methyl is only known in combination with other bodies. By the action of chlorine on certain methyl compounds the body CH_3Cl is obtained, from which again the bodies CH_2Cl_2, $CHCl_3$, and CCl_4 may be produced. The oxide of methyl $(CH_3)_2O$, or methylic ether, is produced by the action of sulphuric acid upon wood spirit; this ether may be taken as typical of a large series, in which one of the groups CH_3 is replaced by another radicle (either alcoholic or acid). The hydroxyl derivative of methyl, or methylic alcohol—CH_3OH—is prepared in many ways. The most generally employed method consists in rectifying the product obtained by the dry distillation of wood (hence the common name for this alcohol—wood spirit); but in order to obtain perfectly pure methylic alcohol it is necessary to prepare a methylic ether, generally methyl oxalic ether, decompose this by distillation with water, and dehydrate the alcohol so obtained by means of quicklime. Methylic alcohol is a colourless mobile liquid, having a specific gravity of ·8142 at 0°; its boiling-point lies about 60° C. The presence of a certain amount of methylic alcohol in ordinary or ethylic alcohol does not interfere with the use of the latter substance in many chemical operations. Such a mixture is known in commerce under the name of *methylated spirit*. Methylic alcohol yields by oxidation formic acid (CH_2O_2), thus $CH_4O + O_2 = CH_2O_2 + H_2O$.

Methylic alcohol is the first member of a large series of alcohols, the general formula of which is $C_nH_{2n+2}O$; the following are the names and formulæ of the best known members of this group.—

Methylic Alcohol,	CH_4O.
Ethylic ,,	C_2H_6O.
Propylic ,,	C_3H_8O.
Butylic ,,	$C_4H_{10}O$.
Amylic ,,	$C_5H_{12}O$.
Caproylic ,,	$C_6H_{14}O$.
Œnanthylic ,, &c. &c.	$C_7H_{16}O$.

These alcohols, by partial oxidation, generally yield bodies known as *aldehydes*, which again yield, by further oxidation, corresponding acids. The general equations expressing the formation of these aldehydes and acids may be formulated thus—

(1.) $C_nH_{2n+2}O - H_2 = C_nH_{2n}O.$
(2.) $C_nH_{2n}O + O = C_nH_{2n}O_2.$

By substitution of sulphur for the oxygen in methylic alcohol a substance is obtained having the composition CH_3HS, which is the first member of a series of bodies similarly constituted, and called *mercaptans*. The best known of these substances, and that to which the name of mercaptan is usually applied, is ethylic sulphhydrate C_2H_6HS.

Another important series of methyl derivatives consists of substances known as *methylamines;* these are generally regarded as ammonia in which one, two, or three hydrogen atoms are replaced by one, two, or three atoms of the radicle CH_3. Thus we know of the substances $NH_2.CH_3$, $NH(CH_3)_2$ and $N(CH_3)_3$. Further, as we know of such bodies as ammonium iodide and chloride, so we are acquainted with the corresponding methyl-ammonium salts $N(CH_3)_4I$, &c.

The group CH_3 may also be introduced into many of the natural alkaloids (see STRYCHNINE), giving rise to methyl derivatives of these bases.

METON, or METO, was a celebrated mathematician of Athens, who flourished 432 years B.C. In the first year of the eighty-seventh Olympiad he observed the solstice at Athens, and in conjunction with Euctemon published his cycle of nineteen years, known as the Metonic cycle, by which he endeavoured to adjust the course of the sun and moon, and to make the lunar and solar years begin at the same point of time. This arises from the circumstance that nineteen solar years are nearly equal to 235 lunations, their average values being 6939·68835 and 6939·60249 days respectively. The Metonic cycle was corrected by Calippus. Meton was living about 415 B.C., for when the Athenian fleet was sent to Sicily he escaped a share in that disastrous expedition by counterfeiting insanity.

METONIC CYCLE. See METON.

METONYMY (Greek, *metonumia*, change of name), a figure in rhetoric by which the name of an idea or thing is substituted for that of another, to which it has a certain relation. Thus the effect is frequently substituted for the cause, as when *gray hairs* stands for *old age;* a part for the whole, as when *keel* is put for the whole *ship;* the abstract

for the concrete, as 'What doth *gravity* (this *grave person*) out of his bed at midnight!' Other forms are—substance for quality, precedent for subsequent, &c. This is a very common and expressive figure, and is of frequent use in proverbial and other weighty modes of speech.

METOPE (Greek, *meta*, between, and *opē* a hole), in architecture, the interval or square space between the triglyphs in the Doric frieze. The ancients were in the habit of ornamenting these parts of their buildings with carved works, or with paintings representing the heads of oxen, vessels, and other articles used in heathen sacrifices. In the oldest examples of this order the metopes were left quite open. The difficulty of disposing the triglyphs and metopes in symmetrical proportion may have been the cause of their omission in the Ionic and Corinthian orders.

METRE, in versification. See PROSODY and RHYTHM.

METRE, the unit of length in France, = 39·37079 English inches. (See also DECIMAL SYSTEM.) The metre was intended to be the ten-millionth part of the quadrant of a meridian of the earth. The *centimetre*, the one-hundredth part of a metre, possesses more advantages in physics as a unit of length; it is also found very convenient for many purposes for which the English yard is employed. The mass of a cubic centimetre of distilled water at 4° C. is called a *gramme;* and when the centimetre and gramme are the units of length and mass, water at 4° C. is assumed to be of unit density. Hence the mass in a given volume of any body is equal to the volume multiplied by the density. The simplification thus introduced into scientific calculations is very great.

METROPOLITAN is the Greek name of an archbishop. The chief place of a province is called, in Greek, *metropolis*, and as the bishops of the chief places or capitals were distinguished by superior rank, they also received a distinguished title. The metropolitan is above the bishop, but below the patriarch. The title of patriarch, however, is in use only in the Eastern churches. In Russia the metropolitan is at the head of the hierarchy. Generally, in ecclesiastical history, the title is applied to the prelate who presides over the other bishops in the province. The metropolitan is distinguished from an ordinary archbishop by having suffragan bishops subject to him, which the latter may not have. In England the Archbishops of Canterbury and York are metropolitans. The establishment of this order took place at the end of the third century, and was confirmed by the Council of Nice; but some are inclined to trace the germ of it as early as the epistles of Paul to Timothy and Titus. Metropolitans summoned and presided over provincial councils, and consecrated the provincial bishops, and exercised very considerable authority within the sees of their suffragans. *Metropolitan church* is the archiepiscopal church.

METTERNICH, CLEMENS WENZEL NEPOMUK LOTHAR, Prince von Metternich, and Duke of Pontella, a famous Austrian statesman, descended from an ancient family, and born at Coblentz on the 15th of May, 1773. He studied at the University of Strasbourg, and received his legal education in Mainz, after which he travelled for some time in England. He first attracted notice at the Congress of Rastadt, where he acted as representative of the Westphalian nobility. In 1801 he was Austrian ambassador at Dresden, and afterwards held the same office successively at Berlin in 1803–4, and at Paris in 1806. In 1807 he concluded the Treaty of Fontainebleau on the part of Austria. In 1809, when war again broke out, he joined the Austrian court, then at Komorn, and after the battle of Wagram succeeded Count Stadion as minister of foreign affairs. In this capacity he negotiated the marriage of the Archduchess Maria Louisa with Napoleon, and conducted her to Paris. While thus apparently acting in subserviency to the wishes of the French emperor, Metternich was ready to plot for his downfall, and accordingly in 1813, when the French reverses in Russia had made the task comparatively easy, Austria gave in her adhesion to the other allied powers, and declared war against France. For the leading part he had taken in forming the coalition Metternich was made a prince of the empire. From this period the policy, not only of Austria, but in a great measure that also of the leading continental powers, was shaped by him. He was one of the plenipotentiaries who signed the treaty of Paris, and he presided at the Congress of Vienna. His great business now was to arrest the progress of what were called revolutionary principles, and as he had managed to confound these with all tendencies of a liberal character, he literally commenced a crusade for the purpose of banishing constitutionalism from the European continent. With this view he formed the scheme of policy which, to disguise its true character, assumed the equivocal name of the Holy Alliance. For a time his exertions to re-establish absolutism seemed to be successful, and even the British ministry, with Lord Castlereagh at its head, acted in many instances as if imbued with his spirit. The ministry of Mr Canning in 1822 produced the first formal protest against the Metternich policy. Other symptoms, not only of remonstrance but actual resistance, soon appeared, and at last the French revolution of 1830 threatened to destroy the whole fabric which the rulers of the Continent had been so laboriously rearing. At this juncture Metternich gave perhaps the strongest proof of his talents. Not only within the limits of the Austrian Empire was he seen trampling out every vestige of independence, but in other countries also, in the Italian duchies, in the Papal States, in Naples, and even in Spain, his aid by armed intervention, or, where that was impossible, by money and intrigue, was never asked in vain when the object was to support some form of despotism. He must, meanwhile, have had many misgivings as to the ultimate success of the cause with which he had identified himself. A storm was evidently gathering. The liberalism which he had hoped to crush had made so much progress that even Pio Nono, on his election in 1847, deemed it expedient to declare for it. The very next year all Europe was in a flame, and with the exception of Russia, which was threatened only in her western frontiers, where the wrongs of Poland still remained to be avenged, scarcely a crowned head could be considered safe. Austria herself was brought to the brink of destruction, and Metternich, driven ignominiously from the capital, did homage to the freedom which he had all his life been combating, by fixing on Great Britain for his asylum. In 1851, after the bayonets of Russia and a reaction produced by revolutionary violence had re-established the Austrian government, he returned to Vienna, and made a kind of triumphant entrance into his palace. It would have been too hazardous, however, to allow him to make another trial of his policy, and though often consulted and too much imitated by his successor, he remained without official employment till his death on the 11th of June, 1859, at the great age of eighty-six.

METZ, a town of Germany, in Lorraine, on both sides of the river Moselle, near the junction of the Seille, 79 miles north-west of Strasburg. It is regarded as the strongest fortress on the frontier, that of Strasburg, perhaps, excepted. The works are of

great extent, and were constructed after the plans of Vauban and Belleisle. It is walled, has ten gates, and all the resources of engineering skill have been expended on its fortifications. The part of the town on the left bank of the Moselle is flat; that on the right bank rises up from the river in the form of an amphitheatre. Most of the streets are narrow and winding, and several of those on the river bank so steep as to be inaccessible by carriages. The finest parts of the town are along the quays, the opposite sides of which communicate by numerous handsome bridges; and in the neighbourhood of the Esplanade, which is finely planted, and is said to be one of the finest promenades of the kind in Europe. The buildings most deserving of notice are the cathedral, a Gothic structure in the form of a magnificent Latin cross, surmounted by a spire of open work 397 feet high, and with a vaulted roof which rises 109 feet above the pavement; the church of Notre Dame de la Ronde, with a choir, built in 1130; the arsenal, with a cannon-foundry and an armoury; a military hospital; a college; the court-house, containing, in addition to the courts, a public library of 30,000 volumes; the governor's house, town-house, mint, &c. The manufactures consist of woollens, hosiery, hats, parchment, embroidered muslin, stained paper, glue, leather, &c. There are also numerous cotton-mills, breweries, naileries, and tile-works. The trade is in wine, brandy, beer, confectionery, drugs, furniture, leather, iron, &c. It is the see of a bishop, and is well supplied with educational institutions.

Metz (Latin, *Divodurum Mediomatricorum*), under the Romans, rose to considerable importance, being traversed by six grand military roads. Under the descendants of Clovis it became the capital of the Kingdom of Austrasia; and on the decline of the house of Charlemagne passed to the Emperors of Germany, who, in order to make it a barrier against France, strongly fortified it, and allowed it to possess an almost republican freedom. In 1552 it claimed the protectorate of France, and ceased to be free. A heavy battle was fought under its walls between the Germans and French in August, 1870, the Germans subsequently invested it, and being reduced to a state of famine, on October 28 it capitulated with 180,000 officers and men under the command of Marshal Bazaine. It was included in the cession of territory to Germany at the peace signed on the 10th May, 1871. Pop. (1881), 53,131.

MEUDON, a town in France, department Seine-et-Oise, 6 miles E.N.E. Versailles, on the railway to Paris. It has an extensive château, surrounded by an extensive park called the Forêt de Meudon, a favourite holiday resort of the Parisians. As it now exists it was fitted up in 1812 by the First Napoleon for Marie Louise. Meudon has a considerable manufacture of whiting, several glass-works and limekilns, and numerous bleach-fields. In 1842 a fearful railway accident took place here, by which more than 100 persons were burned alive. An expiatory chapel, dedicated to Notre Dame des Flammes, has been erected near the spot where the accident occurred. It also was the scene of frequent fighting during the siege of Paris in 1870–71. Rabelais was for a short time curé of Meudon. Pop. (1881), 6080.

MEULEN, Anthony Francis van der, a battle painter, born at Brussels, 1634, was a pupil of Peter Snayers. Some of his compositions having been carried to France, attracted the notice of Lebrun, and Colbert invited the young artist to Paris, with a pension of 2000 livres and a residence at the Gobelin manufactory. His talents as a battle painter recommended him to Louis XIV., who always took him on his expeditions, and often pointed out the subjects which he desired him to represent. The painter had thus an opportunity of perfecting himself in his department of the art, and is considered, on account of his truth of expression, one of the best battle painters. He was also distinguished in the representation of scenes from common life, and in landscape-painting. Among his most celebrated works are the entrance of Louis XIV. into a conquered city; the entrance of the same prince into Arras; the siege of Maestricht; a horseman with a glass in his hand speaking to a young girl, who is tuning her guitar; &c. He also executed many excellent views of the royal *châteaux* in France. The expression of his horses is particularly admired, and Lebrun, whose niece he married, intrusted to him the execution of the horses in his paintings of the battles of Alexander the Great. Van der Meulen died in 1690. The most celebrated engravers of his time executed a series of 152 engravings from his works, among which those of his pupil Baudoins, which now form the sixteenth, seventeenth, and eighteenth volumes of the great collection called Cabinet du Roi, are distinguished. He was chosen member of the French Academy of Painting in 1673. Though his principal works are in Paris, many of his easel sketches are preserved in England, France, and Flanders.

MEUNG, or Meun, or Mehun, Jean de, a French poet, surnamed from his lameness *Clopinel*, was born at Meung sur Loire, about 1250. He was well informed, and by his poetical talents and vivacity rendered himself a favourite at the court of Philippe Bel. He was satirically inclined, and exercised his wit upon the ladies of the court, who were so irritated against him that a party of them seized him, and resolved to give him a severe flogging; but his wit came to his assistance, and he escaped castigation by desiring the most unchaste to give the first blow. He died about 1322, directing by his will that he should be buried in the church of the Dominicans at Paris; and leaving to that order a heavy chest, not to be opened until after the funeral. The friars, expecting a treasure, opened the chest, but found only some old slates, scrawled with sums and figures. In revenge they disinterred the body, but the parliament of Paris obliged them to bury it again with fresh honours. His principal work was his continuation of the Roman de la Rose, begun by Guillaume de Lorris, which comprises more than three parts of the whole. It is not so poetical as the other, but has more satire and knowledge of the world. He was also the author of a translation of Boethius de Consolatione; the letters of Abelard; a work on the Responses of the Sybils, and a satirical piece styled the Codicil of Jean de Meung, prefixed to Lenglet du Fresnoy's edition of the Roman de la Rose, &c. A revised and corrected edition of the Roman de la Rose by Francisque Michel was published at Paris in 1864.

MEURTHE, La, a river, France, which rises on the western side of the Vosges, in Mount Bon Homme, department of Vosges, and proceeding north-west past St. Dié, enters what is now the department of Meurthe-et-Moselle, passes Nancy, where it becomes navigable, and joins the right bank of the Moselle, about 7 miles below; total course, about 100 miles. Its principal affluents are the Vezouze, Mortagne, and Sanon.

MEURTHE-ET-MOSELLE, department of, an administrative division of the north-east of France, which owes its name to the old departments of Meurthe and Moselle. It is bounded on the north by Luxemburg, on the east by Alsace-Lorraine, on the south by the department of the Vosges, and on the west by that of the Meuse. In consequence of the Treaty of Frankfort (10th May, 1871), by which France was to cede to Prussia a portion of her territory on the east, the National Assembly voted, 7th September,

1871, the formation of the department of Meurthe-et-Moselle, comprising three arrondissements of the old department of Meurthe remaining to France and a small portion of the old department of Moselle, of which was formed an arrondissement, having Briey for its capital. The new department as thus settled has four arrondissements—Nancy, Lunéville, Toul, and Briey—twenty-nine cantons, and an area of 2024 square miles. The surface is finely diversified by hill and dale, and the soil varies much in quality. The principal cereals are wheat, oats, and barley. A great quantity of the best land is devoted to the vine, and in favourable years yields large returns. Fruits of various kinds and of good quality are extensively grown. The domestic animals are of inferior breeds. The most important as an article both of food and export is swine. The strata belong to the upper series of the secondary formation, and exhibit a large development of the Jura limestone, which is extensively worked, and yields in particular localities good marble. In a recent year about 1,000,000 tons of iron ore were raised from the beds near Nancy and Longwy, and the department produces a third of the pig-iron made in France. Salt beds having an aggregate area of over 150 square miles and a mean thickness of 65 feet, lie mainly between Nancy and Lunéville, and salt to the annual value of £500,000 is produced. Among manufactures may be mentioned machinery, tools and other articles of iron-ware; furniture; tobacco; woollens, cotton and hemp goods; embroidery; glass, paper, plain and stained; earthenware; leather, &c. In addition to the above manufactures there is a trade in corn, wine, and rape-oil. Pop. (1881), 419,317.

MEUSE (Latin, *Mosa;* Flemish, *Maes;* Dutch, *Maas;* Walloon, *Mouse*), a European river, which rises in France, in the south of the department Haute-Marne, and proceeding north crosses the north-western corner of the department Vosges, and traverses the departments Meuse and Ardennes; on reaching Sedan it enters Belgium, and at Namur, where it receives on the left its largest tributary, the Sambre, almost doubling its volume, changes its course to north-east, and passes Liége, where it is augmented by the Ourthe; separates Dutch from Belgian Limburg, passing Maestricht and Roermond, at the latter of which it receives the Roer. In the northern part of Dutch Limburg its course is changed to north-west, and subsequently it becomes west. The whole of its after course is through the Dutch territory, in which it forms for some distance the boundary between North Brabant and Gelderland. It finally joins the left bank of the Waal, one of the arms of the Rhine, and gives its name to the mighty accumulated flood of these streams, which, proceeding west through Holland Proper, is divided near Dordrecht into two great rivers, the one of which bends round to the north and reaches Rotterdam; the other branch continues west; and shortly after the two branches again unite and discharge themselves into the North Sea. The direct length of the Meuse is 230 miles; and its length, including windings, 580 miles. It is navigable for about 460 miles. In the lower part of its course it waters vast alluvial plains, which, in a great measure gained from it by Dutch industry and perseverance, it is ever threatening to inundate, and resume as its own domain.

MEUSE, an eastern department of France, bounded north by the department Ardennes and a small corner of Belgian Luxemburg, west by the departments Ardennes and Marne, south by the departments Haute-Marne and Vosges, and east by the department of Meurthe-et-Moselle; length, north to south, 83 miles; breadth, east to west, 40 miles; area, 2404 square miles. The surface is very much diversified and broken, being intersected by numerous ramifications of the Vosges and Faucilles; culminating points about 1600 feet high. They consist of two principal chains, which form the watershed between the basins of the Meuse and the Moselle. The far greater part of the department belongs to the basin of the Meuse, and a considerable portion of the west and south-west belongs to the basin of the Seine. The only mineral of importance is iron, which is extensively worked. Rather more than one-half of the whole surface is arable, and little of it is waste. The soil of the plains is in general thin, and far from fertile; that of the valleys, particularly those of the Meuse and Ornain, deep and rich. The principal crops, besides corn, are hemp, flax, and oleaginous seeds, and considerable tracts are covered with vines, which yield wine of good name. The domestic animals are of inferior breeds; but the rich meadows fatten a great number of oxen, of which there is a considerable export. The dairy produce also is large, and much cream-cheese is made. This department contains numerous manufactures of cotton goods, cotton twist, and hosiery; iron-works, dye-works, glass-works, oil and paper mills, tanneries, breweries, distilleries, &c. For administrative purposes Meuse is divided into four arrondissements—Bar-le-Duc, the capital; Commercy, Montmédy, and Verdun, subdivided into 28 cantons and 586 communes. Pop. (1881), 289,861.

MEXICO, or MEJICO. The Republic of the United States of Mexico, which comprises the former viceroyalty of New Spain, is bounded east by the Gulf of Mexico and Louisiana, west by the Pacific Ocean, north by the United States of North America, and south and south-east by Guatemala. It lies between 86° 43′ and 117° 5′ w. lon. and 15° 58′ and 32° 30′ N. lat. Any attempt which has been made to estimate the area must be regarded as nothing more than an approximation. The most recent official statement estimates it at 753,200 square miles. Nearly one-half of this territory lies within the torrid zone, but the peculiar geological structure of the republic exerts the most striking influence upon the climate. The Cordillera of Mexico separates into two branches, which, diverging to the north-east and north-west, form, as it were, the declivities of an elevated platform or table-land, which in the more central parts is raised to an elevation of 7000 feet above the level of the sea, and extends to the north as far as the limits of the torrid zone. This remarkable elevation modifies the effect of the geographical position of the country in such a manner that while the towns on the central plateau enjoy a mild temperature those on the eastern and western coasts are exposed to a torrid sun, and the intervening space is filled with almost every modification of heat. Again above this table-land rise ridges or single prominences, in which the same appearances are exhibited. Many of the towns are situated at great altitudes above the sea, such as Durango, 6848 feet; Zacatecas, 8169; Catorce, 9254: to the south, Jalapa, 4335; Perote, 7724; La Puebla, 7200; Cuernavaca, 5428: to the west, Valladolid, 6434; Guanaxuato, 6825; Queretaro, 6362; in the centre Mexico is situated in a large valley or basin 7400 feet above the sea. Some of the *haciendas* or residences are about 10,000 feet high, and in some instances carriage roads pass over still more elevated positions. The principal summits, all of volcanic origin, are Popocatepetl (Smoking Mountain), 17,884 feet, still indicating its activity by occasional clouds of smoke and ashes; Orizava, or Citlaltepetl (Star Mountain), 17,373; and Istaccihuatl (White Lady), 15,704. All these are above the limit of perpetual snow, which is here about 15,000 feet. The inhabitants designate the successive climates through

which the traveller passes from the low grounds to the higher by appropriate names: the low hot country is called *tierra caliente;* the higher regions *tierra fria* (cold country); and the intermediate regions *tierra templada* (temperate country). Our division of the year into four periods is there unknown, the only distinction being into the rainy season (*estacion de las aguas*), which commences about the end of May and lasts four months, and the dry season (*el estio*), which comprises the rest of the year. Mexico suffers from want of water. The rivers are few and insignificant if we except the Rio Grande del Norte and the Rio Grande de Santiago. The lakes, which abound, appear to diminish gradually; the principal are Chapala, Zumpango, S. Christoval, Tezenco, &c., in the valley of Mexico; Cayman and Parras, in the Bolson de Mapimi; and the Timpanogos, further north. Among the various productions are maize and other corn, the banana, manioc, tropical fruits, cotton, coffee, sugar, tobacco, indigo, vanilla, cochineal, &c. In recent years the production of coffee, tobacco, and sugar has greatly increased. The first mentioned is grown on the northern slopes of the Mexican tableland, and its cultivation has so much increased that the amount exported trebled itself between 1872 and 1877. Tobacco is grown near Vera Cruz, and in point of quality is ranked along with the finer sorts of Cuba. Maize is produced in almost every part of the country, and in great abundance; its flour forms the chief food of the bulk of the inhabitants. Sugar is raised in considerable quantities. Coffee is also cultivated. Cotton was found among the indigenous productions of Mexico, and was generally used by the inhabitants. The cotton manufactures, though carried on to a small extent, are entirely insufficient to supply the wants of the country, and cotton goods are accordingly the most important import. The raw material, however, might be an important article of export if properly attended to. The domestic animals are the same as in other parts of North America. The wool of the Mexican sheep is of an inferior quality. Different woollen fabrics are manufactured, some of them of very good quality. The manufacture is chiefly domestic. The silkworm is indigenous in some parts of the country, and the silk produced is of an excellent quality, similar to that of the *Bombyx mori* of China. The cultivation of the mulberry and the breeding of silkworms were introduced by Cortez, but were afterwards prohibited by the mother country. Some silk-spinning is carried on; and among other articles manufactured we may mention gold and silver wares, harness, hats, and paper. Manufactures, contrary to what might have been anticipated, have made some progress, but are still comparatively of small importance. Mexico has given to the world an immense quantity of the precious metals. According to authentic records the produce of the Mexican mines (gold and silver) coined from 1690 to 1803 exceeded £270,000,000. In 1882 the total value of the silver exported was estimated at £3,412,755; the produce of the gold mines is now inconsiderable. The richest of the silver mines now worked are those of Real del Monte and Pachuca, belonging to an Anglo-Mexican company. The Mexican ports on the Atlantic side are most of them insecure, and many of them are mere roadsteads. On the western coast there is, however, a series of magnificent ports, from Acapulco to Guaymas, many of which are scarcely if at all frequented. The commercial intercourse on the western side is much less important than that of the eastern coast, most of the countries with which it can be maintained on the Pacific (Columbia, Peru, Chile, China, India, &c.) producing nearly the same kinds of articles. The total imports of 1880 were estimated at £6,112,000. They consist chiefly of cotton and linen manufactures, wrought-iron, and machinery. About one-half of the total trade of Mexico is carried on with the United States. The imports from Britain of British produce in 1882 were £1,[illegible] exports to Britain, £579,570. The total exports in 1882 were valued at £5,816,000, of which silver alone amounted to £3,412,755, the remainder comprising copper ores, sugar, cochineal, indigo, hides, and mahogany and other woods. There were 2[illegible] miles of railway open for traffic at the end of [illegible] and telegraph lines of over 17,000 miles. The chief money of Mexico is the dollar—average value 4[illegible]

The Spanish colony of Mexico was for a long time divided as follows:—1, The kingdom of Mexico; 2, the kingdom of New Galicia; 3, the new kingdom of Leon; 4, the colony of New Santander; 5, the province of Texas; 6, the province of Coahuila; 7, province of New Biscay; 8, province of Sonora; 9, province of New Mexico; 10, province of Old and New California. In 1776 a new division was established into: 1, the viceroyalty of New Spain, consisting of the intendancies of Mexico, Puebla, Veracruz, Oaxaca, Merida or Yucatan, Valladolid, Guadalaxara, Zacatecas, Guanaxuato, S. Luis Potosi, and the two provinces of Lower California and Upper California. 2, the internal provinces depending on the viceroyalty (*Provincias internas del Virey nato*), comprising the province of the new kingdom of Leon and the province of New Santander; and 3, the internal provinces dependent on the governor of Chihuahua (*Provincias internas de la commandancia general*), consisting of the intendancies of New Biscay or Durango and Sonora, and the provinces of Coahuila, Texas, and New Mexico. Upper California, Texas, and New Mexico afterwards fell into the possession of the United States. This republic is now divided into the following twenty-seven states, namely:—Yucatan or Merida, Tabasco, Las Chiapas, Oaxaca, Veracruz, Tamaulipas (New Santander), San Luis-Potosi, Nuevo Leon, Coahuila, La Puebla, Mexico, Valladolid (Mechoacan), Guadalaxara (Jalisco), Sonora, Sinaloa, Queretaro, Guanaxuato, Guerrero, Zacatecas, Durango, Chihuahua, Aguas Calientes, Hidalgo, Morelos, Colima, Tlaxcala, and Campeche; also Lower California, which is not a state, but only a territory. Mexico, the capital of the republic, together with a small portion of adjoining territory, has been erected into a separate federal district. The first census, which was taken in 1793, gave a population of 4,483,529. As the natives suspected the object to be taxation, this number was probably below the truth. Humboldt thinks that it exceeded 5,000,000, and estimated the number in 1803 at 6,500,000, which agreed very well with the results of the census of 1806. The population in 1883 is estimated at 9,[illegible]87,[illegible]29. The inhabitants of Mexico are composed, as in the other Spanish-American states, of three distinct races—the aboriginal Indians, belonging for the most part to the Aztek race, with some hordes of the genuine red men in the north; the Europeans or white men; and the Africans or Negro race, introduced as slaves by the Europeans. These by intermixture give rise to other denominations; so that all may be classed, with reference to caste and colour, as follows:—1. White men, who, if born in Spain, were called Chapetones, or rather Gachupines (*Gatzopin* means, in Aztek, a man on horseback, or rather a centaur—half-man, half-horse); and if natives of America of unmixed European blood, are styled Creoles (*criollos*). 2. Mestizos, the progeny of a white father and a red or Indian mother. 3. Mulattoes, from the union of the white and negro races. 4. The Indians. 5. Zambos, resulting from the mixture of the Indian and Negro races. And 6. The African negro; the unmixed offspring of this

race, born in America, are called Chinos. The distinctions of breed and colour were formerly estimated with much nicety; but they have now lost their importance, the privileges of caste being altogether abolished. It is difficult at the present day to define the exact limits of either the white or the red race according to purity of blood; but it is quite certain that the latter constitute the great majority of the Mexican population. It is probable that 5,000,000, or rather more than one-half, are Indians, the rest comprising a mixture of the various races, the whites or creoles numbering only about 500,000, though some make them twice this number.

It has been said that five-and-thirty distinct languages are spoken by the Indian tribes within the limits of Mexico. But distinct as these tribes may be in language, manners, and even in physical characters, they still have certain points of general resemblance, which seem to prove that, at some remote period, they all issued from one common stock. The Mexican Indian has the general physical characteristics of the indigenous American. He is well made and muscular, capable of supporting great fatigue, and attains a great age unbroken by infirmities. In ordinary habits he is temperate and simple. He rarely tastes animal food; maize, or in the low regions banana, and beans, with the favourite pulque, constitute his subsistence. The dwellings of the Indians vary with the climate. In the warm region on the coast the Indian hut, made of canes and palm-leaves, resembles a great bird-cage. Higher up, where timber is abundant an l shelter acceptable, it takes the form rather of a Swiss or Swedish log-house; but in the cold region on the table-land it is built of sun-dried bricks, with a well-closed timber roof. In all cases the plan is the simplest possible—a single room, sometimes divided into two by a mat partition. The Mexican Indian is habitually grave and taciturn. He can labour, but not with large views or for a distant object; he can improve but slowly, for reason weighs lightly with him against habit. Many Indian families in Oaxaca, Mechoacan, and Puebla, have risen to opulence by the cultivation of the agave for pulque, or by rearing the cochineal.

The Mestizos constitute the majority of the coloured population; they have a pleasing appearance, and are inclined, the women particularly, to corpulence. In character they are much more gentle than the Mulattoes, whose passions are sometimes dangerously violent. The Zambos and Negroes occupy chiefly the sea-coasts and low regions, the climate of which they alone can support. The solitude and hazard of their position, the very slight moral influences and restraints under which they grow up, may perhaps help to explain the bad reputation of the Zambos, who are said to be generally vicious, treacherous, and malignant. The Mexican Creole is distinguishable externally from the true Spaniard by his general meagreness and hard features; in character and dispositions he varies little from the primitive mould, and still exhibits all the pride, frankness, courtesy, and hospitality of his forefathers. The Creoles are naturally the dominant race, and the Spanish language is generally spread over Mexico, being understood if not spoken by almost the whole population.

Up till 1873 Roman Catholicism was the state religion of Mexico, no other being tolerated; but in that year a law was passed which severed the connection between church and state, proclaiming complete liberty of conscience, suppressing the convents, and prohibiting the religious corporations from holding real property. Owing to these measures the Jesuits attempted to incite the people to revolt, in consequence of which they were expelled from the Mexican territory. The clergy are not well educated, and the great mass of the Mexican population is in a state of deplorable ignorance. The policy of the mother country was calculated to keep down all that portion of the inhabitants who now form the population of the republic. All civil, military, and ecclesiastical dignities were in the hands of Europeans, and any attempt towards instructing even the higher classes was discountenanced. The natural sciences were taught, and have been cultivated with some success. The moral state of the country is also far from being favourable.

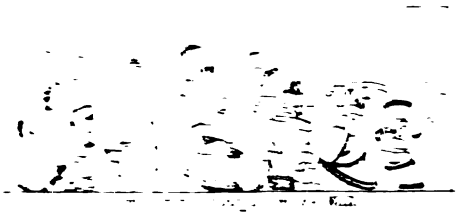
Under the government of Spain Mexico was one of the four great viceroyalties of Spanish America. The viceroy was endowed with all the prerogatives of the king. The only checks upon him were the *residencia*, or investigation into his conduct on his return home; and the *audiencia*, composed of Europeans, and of which he was himself president. The *recopilacion de las leyes de las Indias* was the name given to the heterogeneous mass of decrees by which the colonies were governed. Special *fueros*, or privileges, were conferred on different professional and corporate bodies, which rendered the confusion complete. All the higher officers in church and state were Europeans. A system of peculation, beginning with the chiefs, extended through all the offices of government, and a monstrous corruption perverted the whole administration. The colony was not allowed to manufacture any article which could be supplied by the mother country. The whole trade was confined to a single port in Spain, and all foreigners were rigidly excluded. Books were prohibited, schools discouraged or suppressed, and every measure taken to prevent information from being spread among the inhabitants. The present form of government is that of a federal republic, each member of which manages its own internal concerns. The legislative power is vested in a congress, divided into two chambers—the house of representatives (*camara de diputados*) and a senate (*senado*). The former is composed of members elected for two years by the citizens of the states, one member for every 80,000 inhabitants. The senate is composed of two senators for each state, elected by the state legislatures, the one first named for four years, and the other for two years. The congress is a high court of impeachment, and its powers are to maintain the union, regulate commerce, promote information, open roads and canals, lay taxes and imposts, declare war, approve treaties, &c. The supreme executive power is vested in a president, chosen by the legislatures of the states for four years. He has powers very similar to those of the President of the United States. The council of government (*consejo de gobierno*) exists only during the intervals of the sessions of congress, and is composed of one senator from each state, with the vice-president of the republic at its head. Its duties are to watch over the observance of the federative act and the federal laws, to advise the president to call out the militia, to approve the nomination of officers, &c. For the despatch of business the government is divided into departments, with secretaries at their head. The judicial power is lodged in a supreme tribunal of justice, and in inferior courts, as determined by congress. The supreme court takes cognizance of all matters between different states or individuals of different states, admiralty cases, treason, construction of the constitution, &c. It may itself be called to account by a tribunal constituted for the purpose by the chamber of deputies. The states are organized in a similar manner, with much the same powers and rights as those of the North American Union. The revenue under the old government was £5,000,000; during the first revolution it became exceedingly embarrassed, and did not exceed £1,250,000.

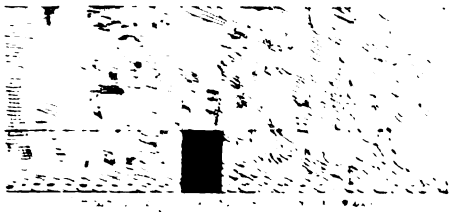
The estimated revenue for 1883-84 was £7,852,000; and the estimated expenditure for the same year £7,644,000; the debt, foreign and domestic, exceeds £28,930,000.

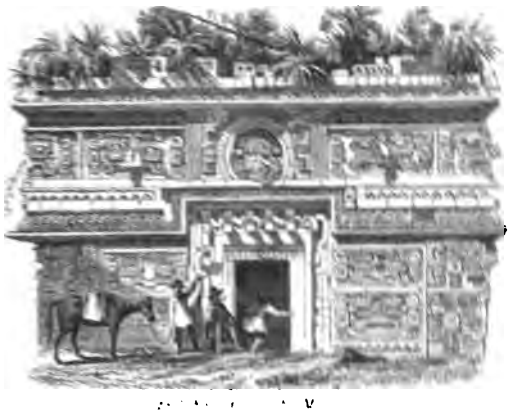
History.—Numerous remains of antiquity which have been discovered in different parts of the country testify to the state of civilization at which the natives had arrived previous to the arrival of the Spaniards. In 1517 Hernandez de Cordova set sail from Cuba at the head of a small expedition in quest of Indian slaves. He landed at Cape Catoche in Yucatan, but was unable to effect his purpose, and was driven back to his ships after some time with the loss of half his men. Velasquez, the governor of Cuba, was induced by the glowing reports of the adventurers, who declared that the wealth and civilization of the inhabitants were greater than those of any other native race that they had seen, to send out a little squadron of four ships, which he intrusted to the command of his nephew Juan Grijalva. Nothing important was done, however, until the third expedition under Hernando Cortez landed on the eastern coast, founded the city of Vera Cruz, and penetrated into the country of Anahuac, occupied by the Azteks. Montezuma then reigned over the country. The capital, Tenochtitlan, bore the title of *Mexico*, which signifies the residence of the god of war, and which was finally extended to the whole region. After the death of Montezuma the capital was taken by the Spaniards (1521), and the whole country fell into their hands. Cortez called it *New Spain*, and was created captain-general, but in 1535 was displaced by a viceroy. We have already given some account of the colonial policy of Spain and the condition of the colony under the Spanish dominion. Such was the condition of the country for three centuries, when the events of 1808 in the Spanish peninsula led to a change in the state of affairs. The Mexicans were in general loyally disposed to their sovereign; but the assumption of authority by a new body, the cortes, and their unwise and inconsistent proceedings, tended to alienate their feelings of attachment. Don José Iturrigaray, the viceroy, in order to conciliate the Americans, proposed to constitute a junto formed of representatives from each province, and composed equally of natives and Europeans, which should organize a provisional government. The latter, however, fearful of losing some of their former superiority, arrested the viceroy and sent him out of the country. The new viceroy, Venegas, displayed an offensive partiality for the Spaniards, and exasperated the Creoles by the severity of his measures. An extensive conspiracy was organized, and the insurrection broke out in September, 1810. A priest, Hidalgo, a man of strong mind and great firmness, put himself at the head of the insurgents; but after some fighting and the commission of great atrocities on both sides, Hidalgo was captured and put to death in 1811. Morelos, a priest in the southern part of the country, who had been named captain-general of the south-west by Hidalgo, had meanwhile raised a considerable force; and meeting with a series of successes, he advanced (in January, 1812) to within a short distance of the capital. In this expedition Vittoria first distinguished himself. Morelos was obliged to retire, but captured Oaxaca and Acapulco. A national congress was assembled at Chilpanzingo, September, 1813, which declared Mexico independent. The forces of the insurgents were afterwards almost annihilated by Iturbide, and Morelos was himself shot in 1815. Vittoria retired to the mountains, where he remained concealed eighteen months. Guerrero alone maintained a small force in the south. In 1817 General Mina landed with a small body of foreigners, and gained some temporary success; but he was made prisoner in July of that year, and shot. Thus in 1819 all the insurgent chiefs had been pardoned or executed except Guerrero. In 1820, the cortes having ordered the sale of the church property, Apodaca the viceroy refused to acknowledge the cortes; he employed Iturbide to reduce Guerrero, but that general joined the insurgent chief, proposed the plan of Iguala, and proclaimed the independence of his country, February 24, 1821. At this time the constitutional viceroy, O'Donoju, arrived in the country, and concluded with Iturbide the Peace of Cordova, by which it was stipulated that the Spanish army should evacuate Mexico. The viceroy and Iturbide were associated in the government, and the army was called the *army of the three guarantees*, the objects to be maintained being the independence of Mexico as a separate monarchy under a Bourbon prince, the maintenance of the Catholic religion, and the abolition of all distinctions founded on caste or colour. A congress was assembled, February 24, 1822, to settle the principles of the constitution. But the cortes having declared the past proceedings null, Iturbide caused himself to be proclaimed emperor, May 18, 1822, under the title of Augustin I. A powerful party opposed the new state of things. After a bloody struggle the emperor offered to abdicate, March, 1823, and was allowed to depart for Europe. A new form of government, on federal republican principles, was now established. Iturbide returned to the country in 1824, but was immediately arrested and shot. On the banishment of the emperor a *poder executivo*, or executive, was formed, consisting of Vittoria, Bravo, and Negrete; and in 1824 the constitution was adopted and proclaimed. Vittoria was chosen president, and Bravo vice-president of the new republic. The first constitutional congress convened January 1, 1825, and held an extraordinary session in August of the same year. In December (20th) the Castle of Ulloa was surrendered by the Spaniards, and the whole Mexican soil was now delivered from European hands. The prospect of tranquillity which was held out by the complete liberation of the country and organization of the government was soon interrupted by the violence of parties. The animosity of the Escoceses and Yorkinos resulted in acts of outrage and bloodshed, and the land was soon distracted with civil war. The Escoceses (Scotch) was a masonic society of Scottish origin, composed of large proprietors and persons of distinction, who were mostly men of moderate principles, but decidedly favourable to the cause of independence. Many of them had at one time been in favour of a Spanish prince as constitutional king of Mexico, and they were therefore often styled *Borbonistas* by their adversaries. The Yorkinos constituted a masonic society, which derived its origin from a masonic lodge in New York, through the agency of Mr. Poinsett, American minister at Mexico. These two political parties (for such they had become) were arrayed against each other on occasion of the choice of the second president in 1828, and also differed as to the policy to be pursued in the treatment of the Spaniards who resided in the country, the Yorkinos being in favour of their entire expulsion from the country. The result of the election, after an arduous contest, was the triumph of the Escoceses party, whose candidate, General Pedraza, was chosen by a majority of two votes over General Guerrero, the Yorkino candidate. General Santa Anna, at the head of a body of troops, declared that this vote was not an expression of the will of the majority, and proclaimed Guerrero president. This movement was unsuccessful; but another was soon organized, and an armed body demanded the expulsion of the Spaniards. After some fighting

MEXICAN ANTIQUITIES.

NATIVE ARCHITECTURAL REMAINS IN YUCATAN







Ruins of the Casa Grande at [illegible]

The Casa del Gobernador at Uxmal

the government was obliged to yield; and General Pedraza, to avoid bloodshed, advised his friends to submit, and expressed his determination to leave the country. Guerrero was accordingly inaugurated president in April, 1829, and a law was passed ordering all Spanish residents to quit the country. In the summer of 1829 an expedition was fitted out in Havana, under the command of General Barradas, to undertake the conquest of the Mexican Republic. A force of 4000 men was landed at Tampico, July 27, but on the 10th of September surrendered to Santa Anna. But the dangers of a foreign invasion were no sooner past than domestic dissensions were again renewed. Guerrero, who had been invested with dictatorial powers on the approach of the invaders, was unwilling to resign them; but Bustamente, the vice-president, immediately advanced upon the capital, and was joined by the forces there. Guerrero, finding himself deserted, abdicated the presidency, and Bustamente was elected by the army his successor. In the latter part of 1830 new disturbances commenced, and a civil war ensued. In 1835 Santa Anna changed the federal into a central republic, and from 1841 to 1844 ruled as a dictator. In 1846 the federal republic was restored. About the same time war broke out between Mexico and the United States on account of Texas, which after having belonged to Mexico, and having been for a short time independent, had been annexed to the United States. The latter proved victorious; and in 1848, when peace was concluded, obtained the cession of New Mexico, Upper California, and several tracts east of the Rio Grande del Norte. An attempt by France in 1864 to establish an empire, with the Austrian archduke Maximilian as emperor, resulted in the execution of the unfortunate emperor in 1867, and in leaving the country as unsettled as ever. (See MAXIMILIAN.) Juarez, the former president, was once more placed at the head of affairs. The treasury was completely exhausted, and the inhabitants, impoverished by the long civil wars, being unable and unwilling to submit to further exactions necessary to replenish it, at last, in 1871, broke out into a widespread insurrection. The president displayed extraordinary energy and activity in endeavouring to suppress the insurrection, but was carried off by apoplexy in July, 1872. One of his councillors, Lerdo de Tejada, was called upon to succeed him, and by rare firmness and the opportune granting of an amnesty, succeeded in reducing the country to a state of comparative order. This state of matters did not last very long, however. In 1876 a rising took place in the north-east under Porfirio Diaz, who in November gained a decided victory over Lerdo, and in February, 1877, was elected president.

Antiquities.—Our knowledge of the early condition of the country since called Mexico is derived in part from the Mexican pictures, many of which were destroyed by the Spaniards. They contained chronological histories, and copies of some of them were made by native Mexicans at the time of the destruction of the originals. The greatest of these was a celebrated table in the possession of Siguenza y Gongora, professor of mathematics in the University of Mexico in 1698. The original is lost, but a copy of undoubted authenticity exists, of which Humboldt has given an account. It begins with the deluge of Coxcox, or, according to the Aztek cosmogony, the fourth destruction of the world. Coxcox, with his wife, was saved from destruction, their descendants received the gift of speech, and fifteen families arrived in Mexico. According to a Mexican author, who wrote soon after the conquest (*Ixtiloxchitl*), the first age, *Tlatonatiuh*, or age of giants, lasted 5206 years: the second, *Tletonatiuh*, or age of fire, 4804; the third, *Ehecatonatiuh*, the age of winds, 4010; the fourth, or age of water, described in the above-mentioned painting, 4008 years. The Tolteks migrated from a country north of Mexico, probably before the close of the seventh century, and about the middle of the eleventh century, being now much diminished in numbers by war, pestilence, and famine, migrated southwards. The Azteks arrived from the north in 1178, and in 1325 founded Tenochtitlan, or the city of Mexico. Clavigero enumerates the collections of paintings which have been preserved; they were executed on skins, cotton cloth, and the leaves of the maguey or agave. At the time of the arrival of the Spaniards the Azteks had attained such a degree of civilization that the right of private property had been long established, cities built, professions and distinctions of rank existed, the arts were cultivated with considerable success, &c. Among the most remarkable monuments of architecture are the *teocallis* or pyramids. The pyramid of Cholula comprises a square of 1773 feet, and is 177 feet high. It is formed of unburned bricks and clay, and is attributed to the Tolteks, who preceded the Azteks in the country. The object is unknown. About 2 miles from Pueblo are a number of pyramids, described by Humboldt. The first, the House of the Sun, has a base of 682 feet in length, and is 180 feet high. The second, or House of the Moon, is 150 feet high. They are both truncated, as is that of Cholula, and are also of Toltek origin. A group of little pyramids surrounds them, which are supposed to have been tombs. In the wall of the cathedral at Mexico is fixed a circular stone, covered with hieroglyphical figures, by which the Azteks designated the months. Near it is a second stone, on which human sacrifices were performed. In the Dominican convent is a large idol representing a serpent devouring a human victim. In Vera Cruz are the pyramids of Papantla, built of colossal masses of porphyry; in Chiapas the extensive ruins of Palenque; and great interest has been excited by the remarkable discoveries of antiquities in Yucatan. For information on the subject of this article the reader may consult the works of Clavigero, Humboldt, Prescott (Conquest of Mexico), Michel Chevalier (Le Mexique ancien et moderne, 18mo, 1863), Stephens's Incidents of Travel in Central America, Chiapas, and Yucatan, and Incidents of Travel in Yucatan (both with many engravings of ancient monuments), &c. Lord Kingsborough's Antiquities of Mexico is a splendidly-illustrated work. (See Pl. CXXV.)

MEXICO, or MEJICO, one of the states of the Mexican confederacy, with a population of about 696,000 inhabitants, is divided into eight districts. It is bounded north by Queretaro, east by Puebla, south and south-west by Guerrero, and west by Mechoacan. Its capital is Toluca; Mexico, the chief city, having been declared a federal city. A great number of valuable mines lie within its territories, and its rich soil yields a valuable agricultural produce. The legislative assembly is composed of nineteen deputies; and the districts are placed each under a prefect, whose duty it is to establish village schools, form a census, &c. Its constitution was adopted in 1827. The former intendency of Mexico comprised the states of Mexico and Queretaro.

MEXICO, formerly *Tenochtitlan*, capital of the Mexican Confederacy, see of an archbishop, lies 7400 feet above the level of the sea. The streets are broad, airy, and run at right angles, but are often badly cleaned, and neither lighted nor watched; the houses spacious, built of hewn stone, three or four stories in height, with flat terraced roofs, and are often not only provided with iron balustrades and gates ornamented with bronze, but covered with porcelain

mosaics. It is situated at about an equal distance from Vera Cruz and Acapulco, in an extensive valley, surrounded with lofty mountains, and containing several lakes, among which are Tezcuco and Xochimilco. It is on the site of the ancient city of Tenochtitlan, but the waters of Lake Tezcuco, on which it borders, have so far subsided that the islands on which the old city was built are now confounded with the main land. The three causeways which connected them still remain, and four have since been built, which are well paved and bordered with trees, forming avenues to the city. Humboldt estimated the population, in 1803, at 137,000; Poinset, in 1822, at between 150,000 and 160,000, and in 1883 it was estimated at 250,000. The principal public buildings are the cathedral, about 500 feet in length and 420 feet in width, which occupies the site of the great teocalli or pyramid temple of the Azteks, and forms one of the sides of the central square; the palace of government, the college of mines, a noble building, but now somewhat dilapidated; the mint, with a front of 360 feet by 250 in depth, the town-house, the university, &c. There are, besides, numerous convents, hospitals, churches, theatres, &c. The public walks are the Alameda and the Paseo. The rides to the Chapultepec, or summer palace of the viceroy Galvez, beautifully situated on an eminence, near which is an aqueduct of 900 arches; and to Tacubaya, a village about 4 miles from the capital, which contains the country residence of the archbishop, are very pleasant. The canal of Chalco, which extends from the lake of that name to the capital, is covered, morning and evening, with canoes of the peasants, conveying fruits, flowers, and vegetables to market; near it are the remains of the Chinampas, or floating gardens, which are surrounded with a broad ditch, and are now, if they were not always, firmly fixed. The inhabitants display a good deal of splendour in their dress and equipages, but many of the wealthiest have been obliged to leave the country by the civil wars. The manufactures, of comparatively limited extent, include gold and silver lace, jewelry, woollen and cotton goods, hats, soap, liqueurs, carriages, and tobacco. The trade is chiefly confined to the export of the precious metals, paid in exchange for various manufactures, chiefly of primary necessity. Mexico enjoys a mild climate, and a pure and healthy atmosphere. It is subject to inundations from the lakes, and numerous works, such as canals, dikes, &c., have been erected as a protection against such a calamity. Tenochtitlan was founded by the Azteks in 1325, and was a rich, flourishing, populous, and active city, the seat of government and of religion, at the time of its discovery by the Spaniards. It was taken by Cortez, in 1521, after a siege of seventy-five days, and a most dreadful slaughter of the inhabitants. The besiegers razed the buildings as they advanced, in order to approach the principal quarter with safety. The ancient city was thus entirely destroyed, and the present city arose on its ruins.

MEXICO, Gulf of, a large bay or gulf of the Atlantic, extending north and south, from the coast of Florida to the coast of Tabasco and Yucatan. It is oval in form, and nearly surrounded by a continuous coast line 3000 miles in length, of the United States and Mexico, and has an estimated area of 800,000 square miles. Cuba divides it into two straits, one to the south, the Yucatan channel, between Cape Antonio and Cape Catoche, 45 leagues wide, through which it communicates with the Caribbean Sea; and another to the north, 40 leagues in width, called the Gulf or Strait of Florida. It receives the waters of the Del Norte, Sabine, and Mississippi. The Mexican ports on this gulf are mere roadsteads. The shores are low, and generally lined with flat sandy islands. The principal current is the Gulf Stream, which issues from it by the Strait of Florida. See Currents.

MEYERBEER, Giacomo, one of the greatest of modern musical composers, was born in Berlin 5th September, 1791. His father, Jakob Beer, was a rich banker of Jewish descent, and of high reputation in the commercial world. Several members of his family have distinguished themselves in science and literature. The young musician—whose original name, Liebmann Beer, was transformed as it stands at the head of our article according to the wishes of a friend of the family named Meyer, who left the youth a considerable fortune—gave early proof of his devotion to the art of music. At the age of five he played tunes spontaneously on the piano, and at nine was regarded as a masterly pianist in a city full of excellent musicians. After studying composition for some time under Bernhard Anselm Weber he entered in 1810 the school of the Abbé Vogler at Darmstadt, where for three years he had the companionship of Karl Maria von Weber. An intimate friendship sprang up between them, which was only interrupted by the death of the latter. While at Darmstadt Meyerbeer composed a cantata, Gott und die Natur, which brought him the appointment of court musician to the grand-duke. In 1812 his opera of Jephtha's Tochter was produced at Munich, but failed to please the audience, though it was highly praised by Weber, Vogler, and other musical authorities. Discouraged by its public reception, Meyerbeer went to Vienna, where he made his debut as a pianist with such success that he seemed destined to eclipse the fame of all contemporary artists. He was, however, commissioned by the court of Vienna to compose an opera, and soon produced his Abimelek, oder die beiden Kalifen, which was no more successful than his former effort, both being contrary to the public taste, which was then delighted by the genius of Rossini and Italian music generally. He was induced by his friend Salieri to visit Italy, and soon became a convert to the new musical school of that country. He rapidly composed in this style a series of operas, which were generally well received:—Romilda e Costanza (1818, for Padua); Semiramide riconosciuta (1819, for Turin); Emma di Resburgo (1820, for Venice); Margherita d'Anjou (1822, for Milan); L'Esule di Granada (1823, likewise for Milan); and Il Crociato in Egitto (1824, for Venice). The success of the last-mentioned opera travelled beyond the Alps, and the composer was invited to Paris to superintend the preparations for the production of the Crociato at the Grand-Opéra, where it met with an enthusiastic reception. Paris now became his head-quarters, but his marriage, and the subsequent death of two infants, induced him to suspend his musical labours until about 1829, when he produced his Robert le Diable, which was not put upon the stage, however, until 1831. The excitement it caused was perhaps unparalleled on the Parisian stage. Meyerbeer had ceased to be a pupil of Rossini, and Robert combined in a singular degree oriental gorgeousness, German massiveness, French vivacity, and Italian brilliancy, which the preceding works of the composer had never prepared the world to expect. He reached the climax of his fame by his next opera, Les Huguenots (Paris, 1836). It was followed at long intervals by Le Prophète (1849); Pierre le Grand (L'Étoile du Nord, 1854), Le Pardon de Ploermel (Dinorah, 1858); and L'Africaine (1865). The composer did not live to see the production of his last work, having died 2d May, 1864, at Paris, and his remains were removed to Berlin, and buried with great ceremony. Besides his operas

Meyerbeer wrote a great number of songs, an oratorio, cantatas, a Te Deum, music for the tragedy of Struensee by his brother Michael Beer, and other miscellaneous compositions.

MEZIÈRES, a town, France, capital of the department Ardennes, on the right bank of the Meuse, opposite to Charleville, with which it communicates by a suspension-bridge, 120 miles north-east of Paris. It is walled, defended by a citadel, and otherwise strongly fortified by Vauban. It has a town-house, prefecture, infirmary, and church; manufactures of ironmongery, cutlery, and leather; and a trade in leather, serge, hosiery, linen, &c. Mezières, under Chevalier Bayard, with a handful of men, resisted Charles V. when, in 1521, he attacked it with an army of 40,000. The allies besieged and took it in 1815, after Waterloo. It was taken by the Germans after a bombardment which nearly destroyed the town, 2d January, 1871, and occupied by them until the end of the following July. Pop. (1881), 6119.

MEZZO, an Italian adjective, which means *half*, and is often used in musical language, as *mezzo forte*, *mezzo piano*, *mezza voce*, which imply nearly the same thing, viz. a middle degree of piano or soft.—*Mezzo soprano*, a pitch of voice between the soprano and contralto.

MEZZOFANTI, Giuseppe, distinguished for his knowledge of languages, was born in 1771, at Bologna, where he was educated and obtained the situation of librarian. In 1831 he was implicated in the disturbances occasioned by the entrance of the French into Ancona. He then formed one of the deputation which proceeded to Rome to make representations to the pope. In Rome he received the title of Monsignore, became secretary to the College of the Propaganda, and succeeded Angelo Mai as first keeper of the Vatican library. The learned who consulted the volumes intrusted to his care spoke highly of his disinterestedness and friendly disposition. In 1838 he was raised to the rank of cardinal. He died at Naples in 1849. Mezzofanti's European fame rests less on his literary labours than on his remarkable talent for learning foreign tongues. Towards the end of his life he is said to have understood and spoken fifty-eight languages.

MEZZOTINTO. See Engraving.

MHOW, or Mow, a town and British cantonment, Hindustan, Holkar's Dominions, in a clayey tract resting on basalt, 13 miles south-west of Indor. The town, situated on an eminence above the Gumber, is European in its appearance, having a church with a conspicuous steeple, a well-furnished library, a spacious lecture-room, and a theatre. The cantonment, occupied by a considerable force, in virtue of the Treaty of Mundisor, is situated about half a mile south-east of the town, at the height of 2019 feet above the sea. Mhow was one of the centres of the Sepoy mutiny of 1857.

MI, the name given by Italian and French musicians to the third note of the natural scale, and which therefore corresponds to our E.

MIAKO, or Kioto, a large city, Japan, in the island of Niphon, in an extensive plain on the Yedogawa, 250 miles south-west of Yeddo, formerly the special residence of the Mikado, and the seat of his *dairi* or court, and hence the ecclesiastical capital of the empire. It is about 4 miles long and 3 miles broad, and abounds in exquisitely laid-out gardens, palaces, and temples. The houses, which are for the most part built of wood plastered with lime and clay, do not exceed two stories in height, and are formed into long and narrow, but regular lines of street. Miako is the centre of the learning and science of Japan; by far the greater portion of all the works published in the empire emanating from the dairi, which is regarded as the principal college, not simply for the study of theology, but for all the various branches of literature; and in manufactures no place in Japan can rival Miako; carved ornaments, japanned wares, and other articles, being made here of a kind and quality far superior to anything that is allowed to be exported to Europe. Every house in the city has a store-house attached to it, well provided with these objects of manufacture. Pop. in 1881, 239,425.

MIANI, or Meanee, a village situated on a branch of the Indus, 6 miles north of Haidarabad, the scene of a battle fought on 17th February, 1843, in which Sir Charles Napier defeated the Ameers of Sind. The British force numbered 2800 men, the enemy over 20,000. This and the subsequent battle of Dubba were the two principal engagements in the campaign which led to the annexation of Sind.

MIASMA. See Malaria.

MICA is a name used to designate a species of minerals, which are all of a more or less laminated structure. Micas are essentially silicates of aluminium, and are generally divided into potash and magnesia micas. The former includes *Muscovite* or common mica, *Lepidolite* (which contains from 1 to 6 per cent. of lithia), &c. In the latter class are included *Phlogopite*, or rhombic mica, and *Biotite*, or hexagonal mica, &c. The general formula for the potash micas is, according to Rammelsberg, $2\,M_2O.3\,SiO_2 + n\,(2\,R_4O_3.3\,SiO_2)$; and for the magnesia micas, $2\,M_2O.SiO_2 + n\,(2\,R_4O_3.3\,SiO_2)$, where M = a monatomic metal, generally sodium, potassium, or lithium, and R = a sesquiatomic metal, generally aluminium, chromium, iron, or manganese.

MICAH, the sixth of the minor prophets, was a Morasthite, of the tribe of Judah. He prophesied in the reigns of Jotham, Ahaz, and Hezekiah. His prophecy is directed against Samaria and Jerusalem, whose sufferings he declares shall be greater than those of Babylon and the other Gentile cities. His style is pure and correct, his images bold, his denunciations full of strength and severity.

MICHAEL (Hebrew, 'he who is equal to God') is spoken of in Daniel (x. 13, 21; xii. 1) as one of the 'chief princes,' and the 'great prince.' In Jude (verse 9) he is called the 'archangel who disputed with the devil about the body of Moses.' In the Revelation (xii. 7) it is said 'there was war in heaven: Michael and his angels fought against the dragon.' From this expression it has been inferred that he was the chief of the celestial hierarchy, and it is in this character that the Catholic Church pays him religious honours. Milton calls him 'of celestial armies prince,' and 'prince of angels,' and attributes to him the command of the heavenly forces.

MICHAEL, St. (*San Miguel*), the largest of the Azores, was discovered in 1444, and taken possession of by Cabral, in the name of Portugal, to which power it now belongs; lat. 37° 50′ N.; lon. 30° 30′ W.; 25 leagues south-east from Terceira. In the interior it is mountainous, some of the peaks rising to a height of more than 3500 feet, and evidently of volcanic origin. Earthquakes are frequent, and the soil is in many places composed of volcanic products. In the valleys it is fertile, and produces corn, potatoes, grapes, peaches, and plums, but the products for which St. Michael is most famed, and from which it derives its largest source of revenue, are oranges and lemons, of which 120,000 boxes are annually exported. The coast abounds with fish, and there are many mineral springs in the interior. The climate is mild and agreeable. The commerce is considerable, principally with Britain, Portugal, and the United States. The population is about 115,000; capital, Ponta Delgado.

MICHAELIS, JOHN DAVID, a celebrated theologian and orientalist, born at Halle, Feb. 27, 1717, where his father, Christian Benedict, was a distinguished professor of the same branches. John David received his first instruction from his father, and afterwards studied in the orphan house at Halle. After taking his degrees he made a journey to England and Holland, where he formed connections with several learned individuals in London and Oxford, and in Leyden. After his return to his native country he prosecuted his studies with ardour, and on the death of Professor Ludwig was intrusted with the preparation of a catalogue *raisonné* of the Halle University library. In 1745 he was made professor of philosophy at Göttingen, where in 1751 he was appointed, with Haller, to draw up the constitution of the new royal society of sciences, of which he was secretary and director, until some differences with one of his colleagues induced him to resign his posts and leave the society. From 1753 to 1770 he was one of the editors of the Göttingen Literary Notices, and from 1761 to 1763 was librarian to the university. After the death of Gesner (1761) he undertook the direction of the philological seminary, from which so many eminent philologians have proceeded. During the troubles of the Seven Years' war Michaelis was employed in making preparations for an exploring expedition into Arabia, which was afterwards undertaken by Niebuhr, and which contributed many important explanations to obscure passages of Scripture. He died in 1791. His labours in biblical criticism and history are of great value. His principal works are Mosaisches Recht (six vols.; second edition, five vols. 1776–80, translated into English, under the title of Commentaries on the Laws of Moses); Introductions to the Study of the Old and New Testaments (the latter has been translated by Marse); Spicilegium Geogr. Hebræorum; Translations of the Old and New Testaments; and grammatical and lexicographical productions. Heyne and Eichhorn have furnished tributes to his memory, and he has also left a biography of himself.

MICHAELMAS DAY, properly named the Day of Michael and All Angels, is a great festival of the Roman Church, and also observed as a feast by the Church of England. It falls on the 29th of September. In England it is one of the four quarterly terms or quarter-days, on which rents are paid. It is a prevalent English custom to have a goose for dinner. Queen Elizabeth is said to have been eating her Michaelmas goose when the tidings of the defeat of the Spanish Armada were brought to her.

MICHAUD, JOSEPH FRANÇOIS, a French historian and publicist, born in 1767, in a village on the frontiers of Savoy, went in 1791 to Paris, where he soon attracted notice by his numerous literary labours. His first separate work was a Voyage Litteraire fait en 1787 au Mont-Blanc. By cutting articles in the journals he made himself so disagreeable to the republican rulers that the convention pronounced sentence of death upon him. His friends succeeded in annulling the sentence, though he continued to be subjected to much persecution. In 1797, when editor of the royalist Quotidienne, he was condemned, with several other journalists, to be transported to Cayenne, but succeeded in escaping to the Jura, where he wrote his famous descriptive poem, Le Printemps d'un Proscrit. After the 18th Brumaire he returned to Paris, where, in addition to journalism, he employed himself with historical researches. His principal works are, Histoire des Progrès et de la Chûte de l'Empire de Mysore sous le Règne d'Hyder Aly et de Tippoo Saib (two vols. Paris, 1801), Histoire des Croisades (eighth edition, four vols. Paris, 1853; improved edition, 1856), and in connection with the latter, Bibliothèque des Croisades (four vols. Paris, 1830). In 1802 a Biographie Moderne appeared from his pen, but was suppressed by the police. A more important undertaking was the Biographie Universelle, the special management of which was undertaken by his brother. He was an adherent of the Bourbons, and in 1816 gave free course to his hatred of Napoleon in a pamphlet entitled Histoire des Quinze Semaines, ou le Dernier Règne de Bonaparte, which went through twenty-seven successive editions. We should add, however, that he frequently floated between the political parties, being by turns royalist, republican, and imperialist. In 1813 he was admitted to the French Academy, and in 1815 was a deputy to the Chambre Introuvable. His situation as censor and reader to the king, which was bestowed upon him shortly after the return of the Bourbons, he resigned in consequence of disapproving of the severe measures adopted against the freedom of the press. The period from 1820–24 was partly employed in preparing the much-read Lettres Champenoises. He suffered much from disease during the latter years of his life, and retired to Passy, where he died in 1839.

MICHELET, JULES, a French historian and miscellaneous writer, was born in Paris, 21st August, 1798. He was the son of a not too wealthy printer, who yet contrived to give him a good education. Young Michelet studied with brilliant success under Villemain and Le Clerc, at the Collége Charlemagne. After completing his studies here he devoted himself to the teaching of languages, and in his spare time to the zealous study of history. In 1821 he was called to the chair of history in the College Rollin, where he was also professor of ancient languages and of philosophy till 1826. In the following year he was made maître de conférences in the Ecole Normale, and after the revolution of 1830 was appointed chief of the historical section of the archives of France, and was chosen by Guizot, who was diverted from literature to politics, to continue his lectures in the Faculté des Lettres. His academical lectures became distinguished for appeals in favour of democracy, and for assaults upon the Jesuits, against whom he waged a violent warfare. No professor of history in the Collége had ever attracted so large and enthusiastic an audience, and the clerical party used all their influence to have him silenced, in which they were for a time successful. In 1848 he was restored to his chair, and gave to his lectures the design and character of democratic propagandism, until his course was closed by the government of Louis Napoleon in March, 1851. He lost his place in the archives after the *coup d'état* of December, 1851, by refusing to take the oaths. From that time he held no post at the disposal of the government, but lived the life of an industrious man of letters until his death, 9th February, 1874. As early as 1833 he had begun his Histoire de France, the work which is the chief foundation of his fame. The sixth volume appeared in 1846; other ten volumes appeared between 1855 and 1867. The three last volumes were issued in 1872–73, bringing the history down till the days of the first empire. Scarcely less important is his Histoire de la Révolution Française (1847–53, seven vols. 8vo). His other works in this department of literature are: Histoire Romaine (1831); Précis de l'Histoire Moderne (1828), a work which has gone through more than twenty editions; Précis de l'Histoire de France jusqu'à la Révolution (seventh edition, 1842); Origines du Droit Français (1837). Several of his works on social subjects deserve mention: Des Jésuites (1843), written in collaboration with Edgar Quinet; Du Prêtre, de la Femme, et de la Famille (1844); Du Peuple (1846). About 1856

he turned into another path, and wrote and successively published works on natural history and philosophy, such as L'Oiseau (1856); L'Insecte (1857); L'Amour (1859); La Femme (1860); La Mer (1861); La Bible de l'Humanité (1864), &c.

MICHIGAN, one of the north-western United States, bounded on the north by Lake Superior, on the north-east and east by Lake Huron, on the south-east by a projecting portion of Upper Canada and Lake Erie, on the south by Ohio and Indiana, on the west by Lake Michigan, and on the north-west by the Menomonee and Montreal rivers, separating it from Wisconsin; area, 58,915 square miles. It consists of two separate peninsulas—one on the north-west, washed on the north-east and south by Lakes Superior, Huron, and Michigan; and the other on the south, washed on the west, north, and east by Lakes Michigan and Huron. The north-west peninsula, occupying nearly a third of the whole surface, is comparatively elevated, and presents a succession of mountains and lakes, plains, rivers, and forests. In the interior are extensive sand plains, almost sterile, but relieved by tracts of spruce and sugar-maple forests. The latter tree is particularly abundant, and enables the inhabitants to provide themselves with ample supplies of sugar. Few tracts can boast of being better watered. Numerous minor lakes are scattered over the interior. The coast-line, estimated at 1600 miles, with several large bays and excellent harbours, affords unusual facilities for navigation. The surface of the south peninsula is so level that few elevations occur which deserve even the name of hills. The interior, however, is gently undulating, and rises gradually from the lakes towards its centre. It is mostly covered with fine forests of timber, interspersed with plains and prairies. On the shores of Lake Michigan are tracts of sand, sometimes covered with scanty vegetation, though generally bare; and on those of Lake Huron high sandy bluffs and low swamps prevail; but, with these exceptions, the soil is well adapted to all the ordinary agricultural crops. The rivers, which generally rise near the centre, and flow either west to Lake Michigan, or east to Lake Huron, are both numerous and important, the larger of them being navigable for boats and canoes almost to their sources; small clear lakes also, teeming with fish, are seen in every quarter. The climate is much modified by the peninsular position of the state; and hence, except in the extreme north, the intense cold common in other regions under the same latitude is so little felt that it seldom becomes necessary to house cattle, even in the dead of winter. This advantage has been turned to good account, and both grazing and sheep-farming form extensive and profitable employments. Agriculture, however, is the great staple. As a wheat-producing state Michigan ranks fourth in the Union, the yield in 1880 being 35,532,543 bushels. Next to wheat, the most important crops are Indian corn and oats, which produced in the same year 32,461,452 and 18,190,793 bushels respectively. The remaining crops include barley, buckwheat, rye, hay, potatoes, tobacco, hops, &c. After agriculture, lumbering is perhaps the chief employment. The cultivation of fruit-trees is receiving increasing attention, and considerable quantities of apples and peaches are now exported. The mines in the north-western peninsula produce hæmatite ore, from which is obtained great quantities of excellent iron; and here also are seated the copper mines, in which the metal is found not as an ore, but as virgin copper almost chemically pure. In 1882 one mine produced over 50,000,000 lbs of copper, about one-eighth of the total production of the world. Salt of unsurpassed purity occurs in a basin extending over 8000 square miles, and in 1882 over 3,000,000 barrels were marketed. The important commerce of the state is greatly benefited by its large navigable waters and by its extensive system of railways, which at the end of 1882 measured 4646 miles. The political capital is Lansing (pop. 8319), but the commercial metropolis is Detroit (pop. 116,340). In the primary schools education is free, but a fee may be required for advanced studies in higher schools. The school census embraces all children between the ages of five and twenty, amounting in 1881 to 518,317, of whom there was an average attendance of 391,401. At the head of the educational institutions are the Michigan University, situated at Ann Arbor, and the Normal School at Ypsilanti. The university consists of the department of literature, science, and arts; the department of law; the department of medicine, the college of homœopathic medicine, the school of pharmacy, the college of dental surgery, and the school of political science. In the session of 1881–82 there were 86 professors and other teachers, and 1534 students. The Senate consists of thirty-two members, elected—one half annually—for two years: the House of Representatives consists of not less than 64 nor more than 100 members, elected annually. The governor and lieutenant-governor, elected by a plurality of votes, hold office for two years; all judges and justices of the peace are elected by the people. Michigan became a state of the Union in 1837, at which date it had 174,647 inhabitants. Pop. in 1840, 212,267; in 1860, 749,113; in 1870, 1,184,059; in 1880, 1,636,937.

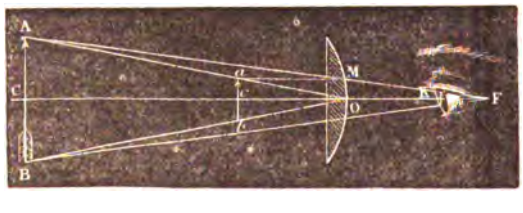
MICHIGAN, Lake, the second largest of the great lakes of North America. It is wholly within the United States, having the state of Michigan on the east and north-west, Wisconsin and Illinois on the west, and Indiana on the south. On the north-east it communicates with Lake Huron by the narrow strait of Mackinaw. It is 350 miles long, and on an average 60 miles broad; area, estimated at 20,000 square miles. Many tributary streams fall into it both from Wisconsin and Michigan. The coast is general sandy, but preserves great regularity. The lake is nearly free from islands, excepting at its northern extremity, and on the Strait of Mackinaw. There are only three bays of any note—Green Bay, the largest, at its north-west end, so called from the unusually dark-green colour of its waters; and Great and Little Traverse Bays, in the same quarter. The lake is said to be 584 feet above sea-level; the greatest ascertained depth is about 1000 feet.

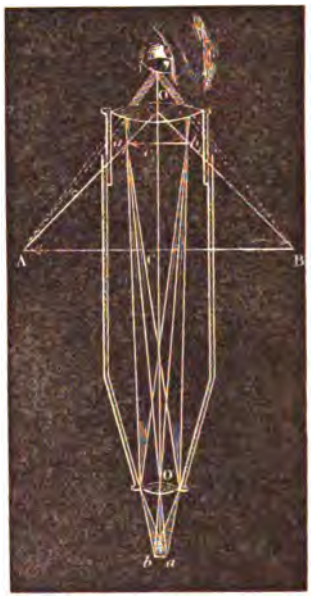
MICKLE, William Julius, a poet, the son of a Presbyterian clergyman, was born in Dumfriesshire, Scotland, in 1734, and received his education at Edinburgh. At first he engaged in business as a brewer, but not succeeding he devoted himself to literature, and removed to London in 1764. In 1765 he was employed as corrector of the press in the Clarendon printing-office at Oxford, where he published a poem entitled the Concubine, in imitation of Spenser, republished with the title of Syr Martyn. He afterwards edited Pearch's Collection of Poems, supplementary to that of Dodsley. In 1775 appeared his principal production, a translation of the Lusiad of Camoens. Prefixed to the poem is a historical and critical introduction including a life of Camoens; and the work itself is executed in a manner highly creditable to the translator. In 1778 Mickle accompanied Commodore Johnson as his secretary on a mission to Lisbon, and died in 1788. His poetical works were published collectively in a 12mo volume, with a memoir by the Rev. John Sim (London, 1806). Among the best of Mickle's original productions is the ballad of Cumnor Hall, which has obtained additional celebrity as giving Sir Walter Scott the groundwork of his novel of Kenilworth. The popu-

lar song, "There's nae luck about the Hoose," has been claimed for him: others ascribe it to Mrs. Jean Adams, school-mistress at Crawford's Dyke, near Greenock.

MICROMETER, an instrument for measuring small distances. The vernier (which see) is a form of micrometer employed on the graduated limbs of instruments to give accurate readings. The *micrometer screw* is used in various forms; the circumference of the head of the screw is divided into a great number of equal parts, and the amount by which the screw is turned at any time may therefore be indicated as a fraction of a whole revolution by means of a fixed mark attached to the instrument near the rim of the head of the screw; the screw works in a nut, through which it advances a distance equal to its pitch or the space between two threads in one revolution: hence a very small advance is accurately measured as a fraction of the pitch by the reading on the screw head. For instance, if the pitch is $\frac{1}{50}$th of an inch, and if the screw head has 100 divisions, then on turning the head through one of the divisions the screw advances $\frac{1}{50}\frac{1}{00}$th of an inch. The *spherometer* is an instrument employed in measuring the curvature of lenses, the thickness of plates of glass, &c.; three equal and equidistant legs support a small metal table, the centre of which forms the nut of a micrometer screw. A 'micrometer eye-piece' is often used in optical instruments; it is an eye-piece which has at its focus a piece of glass ruled with fine parallel lines whose common distance asunder is known: when the image of an object coincides in position with the glass it may be measured. Sometimes the glass is movable, being attached to a micrometer screw. The 'spider thread micrometer' consists of two parallel spider's threads, one of which is movable by a micrometer screw, the other being stationary. More accurate measurements may be taken when the moving frame attached to the screw carries two threads crossing each other. The 'double-image micrometer' is of importance in measuring the diameter of a celestial object; it is an eye-piece containing two halves of a lens, each half being movable by a micrometer screw in a direction parallel to the common diameter. When the halves form one lens the heads of the screws indicate zero. In making an observation of the diameter of a heavenly body the half lenses are so moved that the image formed by one of them of one limb of the body coincides with the image of the opposite limb formed by the other half lens; the readings of the screw heads determine the apparent diameter of the body.

MICROSCOPE, an instrument designed to present a magnified image of a small object to the eye. The early history of the microscope is obscure; it must have been known in its simplest form as a single lens from a very early period, for any transparent body with a curved surface is a lens. In the article OPTICS readers will find a description of the formation of images by lenses. A single convex lens will present to the eye a magnified image of a small object, and is called a *simple microscope*. *a b* is the object placed at less than the focal distance from the lens M O; A B is the magnified virtual image seen by the eye at K. K C is the distance of distinct vision. To diminish spherical aberration Dr. Wollaston employed instead of one lens two plano-convex lenses with a diaphragm between. A diaphragm is a plate of metal with a hole in the centre; it prevents the rays of the circumferential parts of the lenses from reaching the eye. In the 'Coddington lens' this effect is obtained by grinding a groove in the equatorial parts of a sphere of glass. The 'Stanhope lens' is a modification of the simple microscope; it is a thick, double-convex lens, the principal focus of one surface being situated on the other. 'Wollaston's doublet' consists of two plano-convex lenses (focal lengths, 1 :3), the least convex being nearest the eye, fixed in a brass cup, which may be moved towards or from the end of a tube; this end of the tube is closed by a plate of glass, on which small objects may be placed for examination; below the other end of the tube there is a mirror for sending light along the tube; this light passes through a condensing lens, which brings it to a focus just below the object. Simple microscopes are constructed in many different ways to suit different kinds of microscopic work; those of Ross, Gairdner, Field, and Quekett illustrate the principal varieties. In the *compound microscope* the image of an object formed by a lens called the object-glass or 'objective' is magnified by means of another lens called the eye-piece. The objective O forms a real image *a b* of the object *b a* (which is just beyond the principal focus of O), just within the focal length of the eye-piece O′, which thus presents to the eye a virtual image A B at the distance of distinct vision. The objective usually consists of such combinations of lenses as are achromatic and prevent spherical aberration: with these combinations, even when highly magnifying, small diaphragms are never necessary, and hence they give well illuminated images; again, it is often necessary in microscopic work to allow rays to pass obliquely through objects, and in such cases diaphragms would be very inconvenient. To effectually destroy chromatic and spherical aberration and to have high magnifying power it is often necessary to employ





two or three combinations of lenses in one objective; in such cases the magnification is generally effected by the external combinations, aberration being corrected by the internal lenses. The aberrations are so well balanced in good instruments that the relative positions of the different combinations have to be changed when the object under examination is covered with a thin plate of glass or mica. The image of the object formed by the objective may be viewed by eye-pieces of different magnifying powers. The 'negative' eye-piece of Huygens is very common; it consists of two plano-convex lenses, whose convex sides are towards the objective; the lens nearest the objective is called the 'field lens;' its focal length is three times that of the 'eye lens;' the distance between them is equal to the difference of their focal lengths; there is usually a diaphragm in the space between them to cut off the extreme rays. The field lens is sometimes concavo-convex. The principal focus of the combination is between the lenses. The 'positive' eye-piece of Ramsden also consists of two plano-convex lenses, but the convex side of the field lens is turned away from the objective, and the principal focus of the combination is external to the field lens, so that this eye-piece is always needed when a micrometer (which see) is to be used. The lenses are equal in focal length; their distance asunder is two-thirds of the focal length of either. For a good microscope we need an achromatic combination of lenses to form an object-glass, and a well-made eye-piece. The magnifying power of the instrument may be increased by (1) increasing the magnifying power of the object-glass; this is the most perfect method; (2) increasing the power of the eye-piece, a method which is allowable only when the objective is a good combination; (3) increasing the distance between the objective and the eye-piece, a method employed in cases of great magnification. The objectives of highest powers hitherto constructed have a focal length of about $\frac{1}{50}$th of an inch. The magnifying power (which see) of a microscope depends on the focal lengths of the objective and eye-piece, but the definition of the image depends on the object-glass being a good achromatic combination; and it is to be remembered that an object is by no means better seen by making it look larger; in fact, the lowest power under which the eye can distinguish and separate the several parts of an object is always to be preferred. It is sometimes forgotten that much depends on the arrangements for illuminating objects. A 'condenser' is usually an achromatic combination of lenses in the axis of the instrument employed to direct light upon the object; the image of the source of light is directed to a point immediately below the object. Sometimes the objective or eye-piece not in use in the body of the microscope is employed as a condenser; but this practice is not to be recommended. In Gillett's condenser any one of a number of apertures of different sizes in the rim of a sort of saucer may be placed under the condensing lens by turning with the finger and thumb; these apertures have a considerable effect in modifying the size of the pencil of light admitted to the instrument; one of them may be provided with a plate of tourmaline for admitting polarized light. When it is necessary to subject the object to oblique illumination parallel rays of light are made to pass through an obtuse-angled prism, two of whose sides are spherical surfaces; the prism subjects the rays to an internal reflection, and they pass out through one of the curved sides to a focus in the axis of the instrument just below the object. When the source of light is a lamp it ought to have a ground-glass shade. The best illumination is that from a white cloud opposite the sun, its light being passed through the condenser by means of a plane mirror. White-cloud illumination may be imitated by reflecting the light of a good lamp (provided with a concave mirror) from an opaque white unpolished surface, as of plaster of Paris or of finely ground enamel.

In binocular microscopes the object is seen by both eyes, and it has therefore a certain amount of relief. (See STEREOSCOPE.) Wertheim lets a prism receive half of the rays from the objective, subjecting them to two internal reflections to send them to a second

eye-piece. In the accompanying figure A and B are the eye-pieces, which may be brought closer together by means of two racks and a pinion. The prism is at D, just above the object-glass. E is a sliding piece, which lets the body of the microscope approach the stage F. We have thought better in the cut to present to the reader a simplified form of the instrument, as he would really be confused by representations of the secondary stage usually placed below F for supporting achromatic condensers, and the numerous screws and mechanical contrivances employed in various adjustments. G in the figure is a concave mirror for illumination.

The lenses and the stage ought to be firmly connected, and at the same time there ought to be capability of very accurate focal adjustment of the lenses without movement of the object; in fact, the stage must be firmly fixed so that there need be no re-adjustment of the illuminating apparatus; the focal adjustment must allow of movement of from 4 inches to a very small fraction of an inch, and there must be means of delicate adjustment at every part of the instrument; the optical axis of the microscope must remain the same during the movement and during a change in the magnifying power of the eye-piece, so that a 'finder' or eye-piece of small power may be employed before using one of larger power. The adjustment is usually made by means of a rack and pinion or of a fine screw (the screw is employed in the more delicate instruments). As a vertical position of the optic axis is often inconvenient there must be capability of placing the instrument at any inclination without deranging the relative positions of its parts. It may be remarked that when the hands are employed on the stage it is well that the arms should be supported on the table. A moderate amount of dexterity with the hands dispenses with many of the ingenious contrivances which sometimes

so seriously take away from the simplicity of microscopes; such devices add considerably to the time required to put the instrument in its case or to get it ready for work. Readers will find detailed accounts of the use of the microscope and its accessory apparatus, the preparation of microscopic objects, &c., in the special treatises of Carpenter, Beale, and others. Microscopes vary in price from 5*s.* to upwards of £100.

MIDAS, the son of Gordius and Cybele, was, according to the mythological story, an ancient king of Phrygia. While he was yet in the cradle the ants put corn in his mouth, and the soothsayers prophesied that he would acquire great riches. When he was king, and Bacchus was travelling through Phrygia, Silenus lost his way and strayed to the court of the king. Midas hospitably entertained him, and conducted him back to Bacchus, who permitted Midas to choose whatever recompense he pleased. Midas requested that everything he touched might become gold, and the god granted his wish. But when even his food was transformed into gold at his touch he implored Bacchus to take back the fatal privilege. The god then commanded him to go up the river Pactolus, and to dip his head in the sources of the stream, and afterwards to bathe in it. The property of transforming everything into gold was then transferred to the waters of the Pactolus. Pan and Apollo appointed Midas their umpire in a musical contest. Midas gave to the syrinx of Pan the preference over the lyre of Apollo, and was therefore punished by the latter with a pair of ass's ears. Hence the phrase *ears of Midas* often bestowed upon ignorant critics. Midas now exerted himself to conceal this ornament of his head by his royal cap; but he was obliged to uncover his head under the hands of his hair-dresser; and although the king ordered secrecy under the severest penalty, yet the secret weighed upon the barber so heavily, that, to unburden his mind, he dug a hole in the ground and whispered in it, 'King Midas has ass's ears,' and then covered up the hole. Soon after weeds sprang up on this spot, which, when moved by the wind, murmured the words of the barber. Thus the secret was divulged.

MIDDELBURG, a town of Holland, capital of the province of Zeeland, near the middle of the island of Walcheren, 47 miles south-west of Rotterdam, 5 miles north by east of Flushing. It is a good-looking, remarkably clean town, ornamented with numerous spires and towers, surrounded by a broad canal well supplied with fish, and environed by a large number of fine gardens, rich meadows, and bleaching-greens. It is openly built, has numerous squares, of which the great market is the most notable. On the north side of the great market stands the splendid town-hall, composed of two portions: an older, in Gothic style, whose present fronts, overladen with ornaments, were completed in 1518; and a new side-wing, in the Ionic style, finished in 1784. On the north front of the old building are twenty-five colossal statues of the counts and countesses of Zeeland. Among the other important edifices and institutions may be specified the abbey, the courthouses, prison, exchange, gymnasium, academy of design, and other schools; theatre, museum, barracks, several churches, a synagogue, an infirmary, an orphan hospital, and various benevolent, literary, and scientific institutions. The shipping trade is now very limited, though at one time important. Some cotton-weaving, brewing, chocolate-making, tanning, lace-making, worsted-spinning, and salt-refining are the chief manufactures; in addition to which a few vessels are built. It is an ancient place, and was taken by the Dutch from the Spaniards in 1574. Pop. 16,125.

MIDDLE AGES, that period in the history of Europe which begins with the final destruction of the Roman Empire, and by some historians is considered to end with the Reformation; by others with the discovery of America; by others with the conquest of Constantinople; and again, by some, with the invention of the art of printing; all of which may be right, according to the special purpose of the historian. In general, it may be said the middle ages embrace that period of history in which the feudal system was established and developed, down to the most prominent events which necessarily led to its overthrow, though its consequences and influence are still very observable in the states of Europe. (See FEUDAL SYSTEM and CHIVALRY.) The first centuries of the middle ages are often termed the *dark ages*, a name which they certainly deserve. Still, however, the destruction of the Roman institutions by the irruption of barbarous tribes is often unduly lamented, and the beneficial consequences attending it overlooked. True it is that many of the acquisitions which had cost mankind ages of toil and labour were lost in the general wreck, and only regained by the efforts of many successive generations; the flowers of civilization were trampled under foot by barbarous warriors; the civil development of society suffered a most severe shock; those nations to which Roman civilization had extended previous to the great invasion of the Teutonic tribes were thrown back, in a great measure, to their primeval barbarism, and the unruly passion for individual independence in the northern tribes greatly retarded the development of public and private law, and in some countries has entirely prevented a regular civil constitution. Though we admit all this, we ask whether those who deplore the irruption of the barbarians are well aware of the enormous degree to which Roman civilization had degenerated? While, however, the injury which the world suffered from the destruction of Roman civilization has been often overrated, there is, on the other hand, a class of persons who laud the condition of Europe during the rudeness of the feudal ages in a spirit of romantic exaggeration, much like that of certain philosophers who have treated the savage state as that best fitted to nourish and preserve virtue, the one showing ignorance of history, the other of man. Any one may speculate as he pleases on such subjects, but such speculations are foreign to the spirit of history, whose proper office is to state facts, and show the influence of past ages on the succeeding. The feudal system filled Europe with powerful barons, possessing large landed estates, and commanding the services of numerous armed adherents, and with inferior lords protected by the former. They were all possessors of land, with arms perpetually in their hands, too proud to follow any laws except those of honour which they had themselves created, and despising all men of peaceful occupations as ignoble, created to obey and to serve. If, therefore, the classes not belonging to the military caste wished to preserve their independence they could succeed only by union, which would afford them the means of mutual protection, and enable them to exercise their various callings unmolested, and thereby acquire wealth in money and goods, which would serve as a counterpoise to the landed possessions of the feudal aristocracy.

This necessity gave rise to cities. Small cultivators, at first under the protection and superintendence of the counts, bishops, and abbots, to whom they subsequently became so formidable, arose, and attained (particularly in the eleventh century), through their own industry and skill, to a state of prosperity which enabled them to purchase their freedom, and soon to obtain it by force. They did not remain stationary; small states began to grow into great ones; and the most of them became so bold as to acknowledge no superior except the highest authority of the country

to which they belonged. Strong high walls, impenetrable by the rude military art of the time, secured, in conjunction with the valour of the citizens, the freedom of the cities, and protected them from the tyrants of the land; well-ordered civil institutions preserved peace and prosperity within, and were secured by the wealth acquired by trade and manufacturing industry. Many of the nobility themselves, attracted by the good order and prosperity of the cities, established themselves there, and were ambitious of obtaining the offices of government in these commonwealths. In fact they soon usurped the exclusive possession of them in many of the cities. The looser the social organization in any state, and the more intolerable the pride of the nobility, the greater became the prosperity and power of the cities, which grew at length so great that, in Germany and Italy, these republics were formidable even to the emperor. In Arragon the third estate was fully developed as early as the twelfth century. In England the cities, in conjunction with the barons, obtained the *Magna Charta* in 1215; and in France they increased in consequence from the circumstance that Louis the Fat and his successors, particularly Philip the Fair, 200 years after him, found it their best policy to protect them against the nobility, and thereby increase their own means of resisting that order. But the cities of these countries never attained the importance of those of Germany and Italy. What single cities could not accomplish was effected by the union of several, as the league of the Lombard cities in Italy; the Hanseatic, Rhenish, and Suabian leagues in Germany appeared at the same time as great and formidable powers. Under the protection of such associations, and sheltered by the walls of the cities, all arts and trades, and every kind of civilization, made rapid progress. Many of the important inventions which we now prize so highly originated among the citizens of these small free states, or were suggested by their active commercial and manufacturing spirit.

With constitutions similar to those of antiquity, the same spirit appeared to be awakened; all the virtues and vices of Athens, Sparta, and Rome are found in the free states of Italy, where even the climate resembled that of the republics which had perished 1500 years before. There was the same love of country and valour, the same party contests, the same changes of administration and ambitious intrigues, the same (though differently directed) love of arts and knowledge. But the communities were not exempt from the influence of the domineering spirit of the times which they opposed. The overwhelming power of individuals, so dangerous to all free states, became, through this spirit, doubly formidable, and compelled the oppressed portion of the citizens, in the same distress which had given rise to their parent city, to have recourse to the same means of relief. They bound themselves together for the protection of their rights. Such associations, usually formed among people of the same trade, and having for their object, next to security from external enemies, the maintenance of internal order in these stormy times, were called *corporations* or *guilds*, and were under the direction of a master. The strictest regulations appeared necessary for the attainment of this object. No one, without serving an apprenticeship of years, and advancing through certain degrees, could become a member. At a later period admission into the corporation was purchased by individuals who did not follow the business of the members, but wished to share in the advantages of the associations. For in the fourteenth century the corporations became so powerful as to obtain almost exclusive possession of the government of the cities, which until this period the nobility had mostly retained in their own hands. The corporations now taught them that, as they did not contribute to the prosperity of the city by their industry, it did not become them to govern it. The nobility, so far as they continued in the city after this removal from power, preserved themselves in close connection, and those who resided in the country formed confederacies against the power of the cities. Associations which, to the best men, appeared the only means of security from the disorders of the time, became so universal that, almost everywhere, persons of the same trade or profession were closely united, and had certain laws and regulations among themselves. Knowledge itself, in the universities, was obliged to do homage to this spirit, and the liberal arts themselves, in the latter part of the middle ages, were fettered by the restraints of corporations (see MASTER-SINGERS), so that knowledge as well as arts was prevented from attaining that perfection which the secure life of the city seemed to promise them; for nothing more impedes their progress than that pedantry, those prescriptive and compulsory rules, that idolatrous veneration for old institutions, which are inseparable from such associations.

So also the most remarkable institution of that time, its characteristic production—chivalry—exhibited all the peculiarities of the corporations. War was the profession of the nobles. No one of their order who was not a knight could bear a lance or command cavalry; and the services of years as an attendant or squire, were necessary to entitle even one of the highest order to be dubbed a knight. But squire, knight, and baron were all inspired with the same spirit of honour, pride, love, and devotion. The religious zeal of the middle ages produced actions almost inconceivable to the cooler spirit of our time. We see hundreds of youths and maidens, in the flower of their age, shutting themselves up in gloomy walls, or retiring to wild deserts and spending their lives in prayer and penance; we yearly see thousands barefoot and fasting travelling many hundred miles over sea and land to worship at the holy sepulchre; we see hundreds of thousands thronging thither from age to age with the cross and sword, at the risk of life, to deliver the Holy Land from the pollution of infidels.

This enthusiastic spirit was peculiarly suitable to soften the ferocity of the age, but ambitious men artfully turned it to their own selfish purposes. Intolerance, the destruction of the Jews and heretics, the luxurious splendour of the Papal court, and the all-absorbing system of the hierarchy, were the unhappy fruits of this mistaken spirit. In opposition to the secular power, resting on the feudal system, and supported only by armies of vassals, the pope formed, from the archbishops, bishops, and priests, still more from the generals of religious orders, provincials, abbots, and monks, an immense army, invincible through its power over the conscience, and through the spiritual weapons which belonged to it and to its head. From the general belief in his possession of the power to make happy and unhappy in both worlds, to bind and loose for eternity, the pope ruled with absolute sway the minds of Christians. All the kings of the West acknowledged him as the living vicegerent of Christ. Many were vassals to him, many tributary, almost all obedient and subject to him, or in a short time victims of a vain resistance. At the time in which little idea was entertained of restraining the sovereign lords of the land by constitutional laws, and when the spirit of the times allowed them to dare whatever they could do, it was, it is true, an inestimable advantage that the pope aided the people for centuries in opposition to their usurpations; but the practical result of such a system was a spiritual

despotism which held the minds and consciences of men in a state of subjection of a most degrading character. In vain did men like Arnold of Brescia, and the Waldenses, Wickliffe, Huss, and their followers endeavour to overthrow the hierarchy by reminding the people of the simplicity and purity of the primitive church. They found their contemporaries accustomed to the supremacy of the church, not yet ripe for freedom of mind, and inattentive to their remonstrances; and their noble endeavours in a great measure failed. The hierarchy was able to erect new bulwarks against new enemies; mendicant orders and the Inquisition were instituted to prevent the dawning light of the thirteenth century from entering the kingdom of darkness; excommunications and interdicts held Christendom in terror; till at length, when the signs of the times, the diffusion of a free spirit of investigation, the establishment of a more rational order in monarchies, and the cooling of religious enthusiasm, announced that the middle ages were drawing to a close, Luther proclaimed that Europe would no longer be held in leading-strings.

The ages of which we have been speaking, so full of battles and adventures, of pride and daring, of devotion and love, must have been poetic times. The knights were particularly disposed to poetic views by lives spent between battle and love, festive pomp and religious exercises. Hence we see poets first appearing among the knights in the twelfth century. In Southern France, where chivalry was first established, we see the first sparks of modern poetry. The Provençal troubadours, who principally sang at the court of Berengarius of Toulouse, are the founders of it. Soon after them the French trouvères (*ménétriers*) and the German minnesingers sang in their mother tongue; the Italians at first, from mistrust of their vulgar tongue, in the Provençal; and the English, from the same cause, in the French language. But the minstrels soon formed, among the latter also, a national poetry; and the Italians at a later period, after the great Dante brought the Tuscan dialect into honour, obtained, by the improvement of it, a high poetic fame. In Spain the Catalonian poetry was the same as the Provençal, but the Castilian and Portuguese borrowed more from the Arabians. With lyric poetry the epic was also developed in great beauty and power. Its mystic tone, its indefinite longing for something more elevated than the realities of earth, entitle us to distinguish this epic from the ancient by the name of *romantic*.

The romantic epics of the middle ages are mostly confined to three cycles of stories. Italy remained a stranger to these, but her great Dante was worth them all, and stood high above them, though the tone of love and devotion which predominates in his poem sprang from the character of the times. The first of these cycles of stories is the truly German Nibelungen, and the stories of Siegfried, Attila, Dietrich of Berne, Otnit, Hugdietrich, and Wolfdietrich, and other heroes of the time of the general migration of the nations which belong to it. Next to these stories stand the equally old tales of the British King Arthur, his Round Table, and the Sangraal (Holy Grail), which, in accordance with old British or Cymric fables, were sung in France, and afterwards by German minstrels, and to which Titurel, Parzival, Tristan, Iwain, Lohengrin, Gawain, Daniel of Blumenthal, the Enchanter Merlin, and others belong. To these two was added a third, originally French, collection of stories of Charlemagne and his Peers, of Roland, the Enchanter Malegys, and the Four Sons of Haymon. The romance of Amadis de Gaul belongs peculiarly to the Spanish, and to neither of these three collections.

Besides these subjects the poetic appetite of the middle ages seized upon the historic events of ancient and modern times, particularly the deeds of Alexander the Great, and the crusades; likewise upon Scripture history, and even upon the subjects of the ancient epics of Homer and Virgil, for new poetical works. But whether from political causes, or, as we believe, from the downfall of chivalry and from an increasing spirit of reflection, the last centuries of the middle ages were highly unfavourable to poetry. The voice of the minstrel was almost entirely silent in Germany, France, and Spain, even in the fourteenth century; but Italy had now its Petrarch and Boccaccio, and England its Chaucer. In the thirteenth century there was not a story in the cycles above mentioned which was not eagerly sung by many poets; and more than 1400 love-songs, by 136 poets of this century, are contained in the Manesse collection alone; but hardly a single poet appeared among the knights after the fourteenth century.

The epic poems of former times gave place to prose romances, in which their stories were diluted, and the lyric poetry in France and Germany fell into the rude hands of the master-singers, who, by a studied observance of rules, preserved its formal existence. So did it continue till the fifteenth century, which, attentive only to the great events that were in preparation, and the struggles which preceded them, and actuated by the spirit of reflection from which they proceeded, was far removed from that free flow of feeling which had given birth to the poetry of the past time. It was not till the end of the middle ages, when the early spirit of poetry lived only in remembrance, that Ariosto took the stories of Charlemagne's peers from the nursery, and gave them new dignity. Spain and England received a new national poetry from Cervantes and Shakspere. But how great is the difference between these creative geniuses, complete masters of their subjects, who poured forth their whole souls in their poetry, so that one knows not which most to admire—the feeling which inspires, the fancy which adorns, or the understanding which regulates them, and whose humorous (often ironical) tone proclaims them the offspring of modern times, and those simple poets of the middle ages, who took the world as it was, and were rather the organs of the spirit of poetry in the people than independent poets!

Among the arts of the middle ages architecture was distinguished by its peculiar character. In the noblest buildings of antiquity the form of the first rude dwelling-houses is not to be mistaken; they appear only as the ornamented forms of abodes which necessity created, and can only be called fine buildings; but the Gothic architecture of the middle age was founded on a deep and great conception. This conception, which appears in the union of the grandeur of great masses with the most finished delicacy of parts, was the representation of the world. The other arts, which, in the fourteenth and fifteenth centuries, came from Greece into the western world, attained their greatest splendour in the middle ages upon the Lower Rhine and in Italy.

The weak side of the middle ages is the scientific. The youthful spirit of the time, bent upon action, could not devote itself to a sedentary life and continued study. The efforts of Charlemagne to encourage science and instruct the people hardly produced any effect beyond his life, for they were not in the spirit of the time. Several centuries after him the German tribes considered no knowledge of use but that of managing the lance and the steed. The barbarism was so great that most of the laity, even the most distinguished, could scarcely read or write. He who was instructed in these was considered a

distinguished scholar, and he who obtained more knowledge, particularly in mathematics or natural science, exposed himself to the danger of being burned as a sorcerer. But the monks, by their retired situation and the leisure which they enjoyed, as well as by the necessity of some knowledge of the Latin language, which the Roman Catholic ritual required, were driven to a more literary employment, to which they were educated in the schools of the cathedrals and convents. But their literary labours were confined to the copying of the old writers, particularly the fathers of the church, and to accounts of the occurrences of the times in meagre chronicles. Nevertheless we are indebted to them. Through their activity the valuable remains of ancient times, materials and incitements to new improvements, have been in a great measure preserved to us, and from their annals we gather most of our knowledge of the events and manners of that time. Moreover, the Latin language, which was common to all the people of the West, not merely in the affairs of the church, but in science and public transactions, and the study of the literature of Rome contributed much to promote intercourse and improvement.

Notwithstanding the general ignorance, however, as the spirit of man is hostile to a partial development, the need of thinking was again felt in Europe; the taste for knowledge awoke here and there, partly by means of the monasteries, but afterwards through the arts and industry which prevailed in the cities; study was encouraged by Henry II. of England, the Hohenstaufen, St. Louis, the Alphonsos, and other intellectual princes. From these times (the periods of Lanfranc, Abelard, John of Salisbury, and others) the middle ages produced distinguished individuals whom the coldness of their contemporaries in the cause of science only urged to a more ardent pursuit of it. Meantime the necessity was felt of defending the doctrines of the church against unbelief and heresy. This led to the sharpening of the intellect by dialectics; hence the church dogmatics or theology was formed, from which philosophy at length proceeded. As in scholastic theology the dogmas of the church were early received as authority, so in the domain of laws the Roman code soon obtained a complete ascendency; and the jurisconsults of that time were never weary in studying it, learning it by heart, and explaining it by glossaries and illustrations. The students of philosophy pursued the same course with the subtle Aristotle, for whom the middle ages, although acquainted with him only through Arabic translations or *rifaciamentos*, had an unbounded respect. Unfortunately, however, for the progress of philosophy, these commentaries, glosses, and abridgments occasioned the neglect of the original. When the union of scholars in particular places gave birth to universities, these received the stamp of the time both in the corporate character which was given them, and the absorbing interest which was taken in the study of dialectics. Only jurisprudence, theology, and what was called *philosophy* (which was in fact the art of disputing with subtlety upon every subject), were taught; and these sciences, especially since the middle of the twelfth century, had degenerated into a mere tinkling of scholastic sophistry. Medicine, as regards any useful purpose, was taught at this time only by some Arabs, and students of Salerno who had been instructed by them; in other respects it was a slave of astrology, and an object of speculation to ignorant impostors, principally of the Jewish nation. Philology flourished in the time of Lanfranc and Abelard, but was again forgotten in the eleventh and twelfth centuries. Notwithstanding the unprofitable character of what was taught at this time, teachers stood in high esteem, and the highest academic rank was considered equal to knighthood. The universities on their side showed themselves worthy such honour by their independence of pope and prince. With all its worthlessness the disputatious spirit of the time had this good effect, that truths were advanced and maintained in the universities which were alarming to the vigilant hierarchy; and Luther's theses in Wittenberg contributed in no small degree to bring on the Reformation, and thereby to the shedding of new light upon science. Yet the Reformation did not (as many are inclined to believe) give the first signal for higher intellectual endeavours and freedom of thought; it was rather produced by this striving and this freedom, which had originated some centuries before, with the flight of the Greek scholars from Constantinople and the invention of the art of printing, had been encouraged by the lovers of science among the princes of Italy, and had shone forth, even in Germany, in the brotherhood of Deventer, in Wessel, Erasmus, Celtes, Reuchlin, and others. But with the appearance of these men, with the rise of the sun of the new day, the romantic twilight of the middle ages faded away.

MIDDLESBROUGH, a river port, municipal and parliamentary borough, England, in the North Riding of Yorkshire, on the Stockton and Darlington Railway, 6 miles from the mouth of the Tees and 44 miles north of York. In 1829 the site of Middlesbrough was occupied by a solitary farm-house, built out of the ruins of the ancient priory of St. Hilda. The Stockton and Darlington Railway was in course of construction, and some of the persons interested in it and in the collieries in the district through which it passed, seeing that the place offered a more favourable site for loading colliers and for forming docks than Stockton, where the coals were then shipped, purchased 500 acres of land and commenced the building of the town of Middlesbrough. In the following year the railway was extended from Stockton to Middlesbrough, and in June, 1831, a ship was loaded with the first cargo of coals brought down. Founded as a coal-exporting port it owes the wondrous rapidity of its growth to the iron trade drawn hither by the iron ore abounding in the adjacent Cleveland Hills. The commencement of this trade dates from 1840, when the works of Messrs. Bolckow and Vaughan were established on the banks of the Tees. There are numerous blast-furnaces and rolling-mills, extensive foundries, engineering works, and ship-yards, to which have been added in recent years nail-works, wire-works, bolt and nut works, and various minor departments of the iron trade. Close upon two million tons of pig-iron are made annually, much of which is used in the manufacture of rails, angle-iron, ship plates, boilers, &c., every branch of the heavier part of the trade being fully represented. Some of the works are very extensive, as many as 7000 men being employed at one of them. There are also saw-mills, rope-yards, tanneries, breweries, &c. Some years ago, in sinking an artesian well, a bed of salt was struck at a depth of 1300 feet below the surface, and was found to have a thickness of about 100 feet. The discovery has not been as yet turned to account commercially, but it indicates a probable source of future wealth for the town. The streets are well laid out, crossing each other at right angles. In the centre of the older part of the town is the market-place, in which is situated the neat and spacious town-hall. There are many churches, chapels, schools, and public institutions, including a free library. A public park was given to the town by Mr. Bolckow, the first mayor and M.P. of the borough, of whom a bronze statue has been erected. In the centre of the town is the large and handsome Royal Exchange,

opened in 1868, and built in the Italian style, and forming the chief architectural feature of the town, two splendid new banks, a new and elegant passenger station, which give an imposing appearance to the business centre of Cleveland. The town also contains a large mechanics' institute, an athenæum, and a theatre, opened in 1866. The new docks, constructed at a cost of £150,000, have gates 55 feet wide, with a depth of water on sill 22 feet 6 inches at spring-tides. The borough received a charter of incorporation in 1853, and returns by the Reform Act of 1867 one member to Parliament. Pop. in 1841, 5709; in 1861, 18,273; and in 1871 (municipal borough), 39,563, (parliamentary borough) 46,621; while in 1881 it had reached 55,934 and 72,145 respectively.

MIDDLESEX, the metropolitan county of England, bounded north by Hertford, east by Essex, south-east by Kent, south by Surrey, and west by Buckingham. It is further defined by the Thames on the south and the Colne on the west. It is one of the smallest counties in England, but the most important, from its containing the greater portion of the city of London. Area, according to the admeasurement of the ordnance survey, 181,317 acres, of which 115,386 acres are arable, meadow, and pasture. The surface is generally flat, and mostly perfectly level, with exception of the slight eminences, Hampstead, Highgate, and Harrow-on-the-Hill, on the north side of London, none of which exceed 400 feet in height. The county, which belongs entirely to the basin of the Thames, is chiefly occupied by the London clay, the remainder by the plastic clay, which attains a thickness of 100 feet to 120 feet. The soil is various, mostly gravelly, and not naturally fertile, but enriched, especially in the vicinity of London, by a profuse application of manure from time immemorial. A tract of fine, rich, sandy loam also stretches along the Thames, well adapted for garden ground, and is in part so occupied for the supply of the London market. There are some extensive commons in various parts of the county. The principal crops are wheat, barley, potatoes, beans, pease, turnips, and cabbages. But by far the largest part of the county is in grass, there being in 1883, 82,324 acres of permanent pasture not in rotation, the management of which, particularly as respects the making of hay, is extremely well understood. Only 15,353 acres were under corn crops, and 14,202 under green crops. The number of cattle in 1883 was 22,239; of agricultural horses, 4226; of sheep, 23,259. Many early house lambs are fed and grass lambs reared for the London market. Minerals are of no importance; but near London vast quantities of earth and clay have been dug up and converted into bricks. Middlesex returns eighteen members to Parliament, two of which are for the county. Pop. in 1861, 2,205,771; in 1881, 2,920,485.

MIDDLE TEMPLE. See INNS OF COURT.

MIDDLETON, CONYERS, a learned English divine and polemical writer, was born near Whitby, in the county of York, in 1683, and was the son of an Episcopal clergymen. He became a student, and in 1706 a fellow of Trinity College, Cambridge, in which situation he attracted some notice by his quarrel with the celebrated Dr. Bentley, the master of his college. In 1724 he visited Italy, and on his return published a tract designed to show that the medical profession was held in little esteem by the ancient Romans; and in 1729 appeared his letter from Rome on the Conformity between Popery and Paganism. Not long after he obtained the Woodwardian professorship of mineralogy, which he held till 1734, when he was chosen librarian to the university. In 1735 he published a Dissertation concerning the Origin of Printing in England. His greatest literary undertaking was the History of the Life of M. T. Cicero (two vols. 4to, 1741), in which he displays an intimate acquaintance with his subject, accompanied with a degree of elegance in his style and language which entitle him to rank among the principal modern historians of England. In 1743 he published the Epistles of M. T. Cicero to Brutus and of Brutus to Cicero, with the Latin Text and English Notes, a Prefatory Dissertation, &c. In 1747 Dr. Middleton published his Free Inquiry into the Miraculous Powers which are supposed to have subsisted in the Christian Church from the Earliest Ages through several Successive Centuries. This treatise brought on the author the imputation of infidelity, and occasioned a warm controversy, which was continued after his death in 1750. His miscellaneous works have been published in two volumes 4to and five volumes 8vo.

MIDDLETON, ST. LEONARD, a market town, England, Lancashire, agreeably situated at the confluence of two small streams, 5 miles N.N.E. of Manchester. It consists of a principal street, forming a continuation of the highroad between Manchester and Rochdale, and several minor streets irregularly built. The parish church is of a great age, but the date of its erection is not known. There was one here early in the reign of Henry III. There are four other churches and many Dissenting places of worship. The grammar-school was founded by Dean Nowell in 1572; there are also a National and several other schools, a mechanics' institute, a free library, and a handsome market-place. Extensive cotton factories and dye-works give employment to a large proportion of the inhabitants. The silk trade has also a footing here. A branch of the Manchester and Leeds Railway has its terminus in the market-place, and about 1½ mile east the Rochdale Canal passes. Pop. 18,953, including Tonge, which is governed by the same local board.

MIDDLEWICH, a market town, England, in the county of Chester, 18 miles east of the city of that name, on the Trent and Mersey Canal. It has a handsome town-hall, parish church, and places of worship for various Dissenting bodies; several schools; small silk and fustian factories, a condensed-milk factory, a trade, chiefly in salt obtained from brine-springs in the neighbourhood. Fruit and vegetables are also raised abundantly in the vicinity and forwarded to the Liverpool and Manchester markets. Pop. (within the area of the local board in 1881), 3379.

MIDHURST, a parliamentary borough and market town, England, in the county of Sussex, agreeably situated on a gentle eminence on the right bank of the Rothes, 46 miles south-west of London. The town is generally well built, and besides the parish church has places of worship for other religious bodies. A fine public hall was erected in 1881 in the principal street. The town possesses a free grammar-school, a National school, a set of almshouses, and several other minor charities. The iron-works formerly in its vicinity have been abandoned. A market for corn is held on Thursday. The town sends one member to Parliament. Pop. 7221.

MIDIANITES, an Arabian tribe, represented in the Old Testament as the descendants of Midian, son of Abraham by Keturah (Gen. xxv. 2), and described as engaged at an early period in a commerce with Egypt. They dwelt in the land of Moab (Arabia Petræa), to the south-east of Canaan. One portion of them inhabited the country to the west of Mount Sinai, another portion dwelt on the east of the Dead Sea. The Midianitish women having entered the

Jewish camp and seduced the Israelites, Moses was directed by the Lord to send 12,000 men into their country and cut off all the inhabitants except the virgins. This order was executed, and the victors brought off a rich booty. The Midianitish power was finally broken by Gideon's victory, after which their name disappears almost from Scripture history.

MIDLETON, a market town, Ireland, in the East Riding of the county of Cork, and a station on the Cork and Youghal Railway. It consists of one long spacious street intersected by a few smaller ones. It contains a court-house, a market-house, a Protestant Episcopal church, a Roman Catholic church, nunnery, endowed school, bridewell, and union workhouse. The manufactures include woollen fabrics, whisky, and flour. Pop. (1881), 3358.

MIDRASH (Hebrew, *darash*, to make research), among the Jews, is the general name given to the exposition of the hidden meaning of the Scriptures. It dates in its simplest form probably from a Mosaic antiquity, but was more fully developed after the captivity by Ezra, the men of the great synagogue, and the Tanaite series of teachers. Midrash expressed 'any and every ancient exposition on the law, psalms, and prophets, disquisitions that took the form of allegorical illustration, homiletics, or practical commentary.' Thus in its most general meaning it expressed the whole uncanonical Jewish literature, including the Talmud, down to the compilation of the book Jalkuth in the thirteenth century, since which time the term gradually ceased to be applied to rabbinical writings. The Midrash-house was the rabbinical school of instruction. It was by means of this Midrash that the law was made binding on the whole inner life of Judaism in all its complicated interests and conditions. See HEBREW LITERATURE and TALMUD.

MIDSHIPMAN, in the British navy, a young volunteer or cadet appointed by the admiralty, with the exception of one in each ship appointed by the captain. No person can become a midshipman until he has served one year and has passed his examinations, nor a lieutenant without having previously served six years in the royal navy as midshipman, and having further passed examinations in seamanship, gunnery, steam, French conversation, history, geography, and general knowledge. As the pay is only 1*s.* 9*d.* a day a midshipman is more or less dependent on his friends for pecuniary assistance until he attains the grade of sub-lieutenant. His duty is to carry the commands of his captain or superior officer to the seamen and superintend the carrying out of such commands.

MIDSUMMER DAY, one of the English quarter-days for the payment of rent. It falls on the 24th June.

MIDSUMMER EVE. See JOHN'S (EVE OF ST.)

MIDWIFERY is the art of aiding and facilitating childbirth, and of providing for the preservation of the health and life of the mother during and after her delivery. It is founded on physiological and pathological science. With regard to parturition, or delivery itself, it may be interesting to remark that in the great number of cases the labour is what is called *natural*—that is, the child presents itself in the normal position, and unassisted nature completes the delivery within twenty-four hours with safety to the mother and child. It has been calculated that 990 in 1000 are natural labours. Midwifery in some form has been employed from the most ancient times, even among the rudest nations, although it was at first very defective, and consisted probably only in the most obvious and indispensable manual applications and aids. Even in the most cultivated nations of antiquity this art was in a low state. The Israelites had their midwives. The first accounts of scientific male midwifery are to be found among the Greeks of the age of Hippocrates (who died 357 B.C.) From the writings of that period we learn that the obstetrical art had then reached a higher degree of cultivation among the Greeks than in most parts of Europe during the last century. Notwithstanding there was much that was wrong and injudicious in their system, and only a small part of the proper means of assistance was made use of. They often contented themselves with invoking Eileithyia, the goddess of childbirth. Among the Romans midwifery was confined to a few simple aids, and sacrificing to Juno, Lucina, and other deities who presided over childbirth. It was not till a later period that the Roman women commonly employed midwives; but in difficult cases the physicians were called in. These were either Greeks living in Rome under the dominion of the Roman emperors, or they drew their knowledge chiefly from Greek authors. To this epoch belong particularly Soranus (100 A.D.) and Moschion, who composed the first manual of midwifery which has come down to us. In the middle ages the science was very much neglected; it was confined to the cutting of the fœtus from the body of the mother in case of her death before delivery. In consequence of the injudicious interference of the popes, who conferred the professorships in the newly-established schools on the monks, and gave them the privilege of practising physic, while they strictly prohibited the practice of surgery and anatomy both to the physicians and laity (1215), the obstetric art became more confined to internal and superstitious applications, and indeed generally sank into the hands of women, monks, peasants, and other ignorant persons. When they had exhausted their medical skill the saints were invoked, images and relics were hung upon the woman in labour, &c. The art continued in this state till the sixteenth century. At this time the improvements in printing and engraving gradually introduced a better era, since the surviving works of the Greeks, Romans, and Arabians were multiplied, the intellectual intercourse among men became more general, and the spirit of inquiry was awakened, and found a wider field. At this period the business of midwifery was so exclusively in the hands of women that it was disgraceful for a man to engage in it. Such an undertaking was considered as an abominable attempt on the virtue and honour of the female sex, and he who ventured upon it as a magician. In Hamburg, in 1521, one Veites was condemned for this offence to the flames. Several books, however, were published for the better instruction of midwives in their profession. The first was by Eucharius Rösslein, at Worms, called the Rose-Garden for Midwives and Pregnant Women (1513). The science of anatomy, which was now more freely studied and patronized, also contributed much to the improvement of midwifery, in which Vesalius, in Padua, (1543), particularly distinguished himself. The physicians and surgeons turned their attention only to the theoretical part of the science, but the latter gradually proceeded to the practice of it, by performing the Cæsarean operation (which was now not only permitted, but commanded by law) on women who had died in childbirth, and gradually undertaking other operations on women pregnant and in labour. Francis Rousset, a surgeon in Paris, published a treatise in 1581, in which he brought several proofs of the possibility of safely performing the Cæsarean operation on the living mother, and it was he who first gave this operation its present name. After the publication of this treatise the operation was frequently performed on the living subject, both in and out of France, and sometimes even when it was not unavoid-

ably necessary. Pineau, a surgeon in Paris, first suggested, in 1589, the section of the pubes, by the observations which he communicated on the separation which takes place between the bones of the pelvis, for the purpose of facilitating birth when made difficult by the extreme narrowness of the pelvis. In Germany midwifery long remained in an imperfect state: the midwives were generally ignorant, and men were seldom employed; while in France and Italy it was already a common thing to call in the aid of physicians and surgeons. A surgeon of Paris, Clément, distinguished in the practice of midwifery, who had attended La Vallière, the mistress of Louis XIV., in her delivery, first received the name of *accoucheur* as a title of honour. The surgeons were so well pleased with the name that they gradually adopted it as a general appellation. Henry of Deventer, a surgeon of Holland, was the first who, in 1701, endeavoured to establish midwifery on scientific principles. In France, where the art had risen to higher perfection than in other countries, a school for midwives was established in the Hôtel Dieu in 1745. The history of the origin and invention of the forceps, that highly useful instrument in midwifery, is involved in some obscurity. Between 1660 and 1670 Chamberlen, a London surgeon, professed to have invented an instrument with which he was able to terminate the most difficult labours without injuring either the mother or child; but he kept this discovery to himself, and in 1688 went to Amsterdam, where he sold it to certain practitioners, who turned it to their profit. It was thus kept secret among certain persons for a long time. At last Palfyn, a famous anatomist and surgeon of Ghent, in Flanders, got some knowledge of the instrument, and caused one to be made, 1723. Some species of forceps appear to have been known even in the time of Hippocrates; but the merit of Chamberlen's invention consisted in making the blades separable, and capable of being locked together after having been introduced into the vagina, and placed one on each side of the head of the child. It was afterwards very much improved, especially by Levret, in Paris, 1747; Plevier, in Amsterdam, 1750; and Smellie, in London, 1752. The art of midwifery was also perfected by the writings and instructions of these men. Germany, too, produced several men of eminence in this department of the medical art, who were not only famous for their operative skill, but contributed much to the advancement of midwifery by their observations, and to the diffusion of correct principles on the subject by their lectures and writings. The establishment of several schools of midwifery, and the appointment of professors of or lecturers on midwifery in all the English medical schools (except the Universities of Oxford and Cambridge), also facilitated the study of the art, and brought it to its present degree of perfection. Not only is a knowledge of this department now required from every candidate for the medical profession, but the ignorant midwives of past times are now superseded by well-educated nurses with diplomas certifying that they have attended lectures on midwifery, and taken personal charge in a certain number of cases under the superintendence of a qualified instructor. Those physicians of modern date who have contributed most to this art in Germany are the two Starks in Jena, Osiander in Gottingen, Siebold in Würzburg, Wigand, Nagele, Boer, Jörg, &c.; in England, Smellie, William Hunter, Denman, and Bland; and in France Baudelocque and Astruc. The course now adopted seems to be the true one, viz. by the cultivation of all the branches of knowledge connected with this department, to determine the cases in which art may and ought to be passive and leave the work to nature, and those in which nature is insufficient to accomplish the delivery alone, or at least without injury to the mother or child.

MIGNONETTE (*Reseda odorata*), a plant of the natural order Resedaceæ, a native of Egypt. The very agreeable odour of this unpretending plant has rendered it a universal favourite among all nations. It bears the climate of Britain perfectly well, and brings its seeds to maturity. It has lanceolate, bluntish, entire or trifid leaves, and a six-parted calyx equal in length to the petals, which are finely cleft into many club-shaped divisions, the two lowest simple, the capsules three-toothed. It was introduced into England by Lord Bateman so recently as 1752, from the Royal Garden at Paris, and had not then been long known in France; yet now it is to be met with in every garden during summer, and every greenhouse during winter, in Britain. It is also cultivated in flower-pots, apartments, and in the boxes which are placed on the outside of the windows of houses in towns. Mignonette (French, little darling) is its popular name everywhere. Being in so much demand as a chamber flower, it is important to have a succession of plants in all seasons. It is usually sown in gardens in April, and flowers in June. In a forced culture, for flowering from December to February, a sowing should be made in July in the open ground, and the plants potted in September and removed indoors. The spring crop should be sown in pots not later than the end of February, and will be in perfection by the end of May. A sub-biennial variety, called *tree mignonette*, rather more odorous than the common sort, is well suited for the drawing-room. If left to itself it can be scarcely distinguished as a distinct variety; but if trained against a wall, or to a stick, it may be made to assume a shrubby appearance.

MIGRATION OF ANIMALS. By this term is implied the phenomena of certain animals moving, either periodically or at irregular times and seasons, from one locality or region to another and sometimes far distant territory. No phenomena observed in the history of animal forms present more remarkable features than these migratory habits. The causes of migration are imperfectly understood, and in many cases have not been determined at all; and the unerring instincts—if thus we may term them—which lead animals to return to their original habitats over many thousand miles of sea and land at a certain time, and with undeviating punctuality, form collectively a series of problems from the solution of which modern zoology is as yet very far removed. Migration is observed in mammals, birds, fishes, and insects, but it probably occurs in other groups of the animal world, the observation of which is less easy than that of the higher forms. Mammals do not appear, in the majority of instances in which migration occurs, to change their habitats with the periodicity and regularity of certain birds for example. A scarcity of food in one locality, or its plenty in another district, may be cited as among the most obvious causes of the migratory or erratic habits of quadrupeds. Yet in the case of the lemmings (which see) of northern Europe, this one cause does not appear wholly or satisfactorily to account for the migrations of these animals, or for the remarkable manner in which their journeys are pursued. These creatures thus leave their haunts in the autumn, travel southwards, and proceed throughout their journey in a straight undeviating course; crossing in their march such lakes or rivers as may lie in the track, and allowing no obstacles whatever to hinder the onward progress of the migration. This migration appears to be spontaneous and irregular in its periods; and ordinary causes fail to satisfactorily account for its occurrence. The buffaloes or bisons of North America, and the herds of mustangs or wild horses, would

appear at irregular intervals to desert one district for another; but such cases can scarcely be deemed instances of true migration. The study of the distribution of fishes has led to the observation of much that is new and interesting in connection with changes of locality and habitat in these forms. Some fishes, as for example the herrings, were formerly believed to migrate northwards to the Arctic seas in the spring months, and to return southwards during winter. This supposed migration has however been denied on good grounds; and the present belief, warranted by observation, is, that the herrings live in deep waters during the warmer months of the year, and ascend to the surface waters in their due season. The breeding-seasons of fishes, and the periodical journeys which many fishes (for example salmon, lampreys, &c.) make from the sea towards fresh-water streams and rivers for the purpose of depositing their eggs, fall under the consideration of migratory habits; but for these latter cases, and also for the migrations of the land-crabs (which see), a definite explanation necessarily exists. The migratory habits of locusts, and those of certain species of ants, &c., exemplify migration among insects; but amongst the birds we meet with the best-marked instances of migration, and also with those cases the causes and nature of which are still a matter for inquiry and observation. Not only do many birds return to the exact spot from which they migrated, but the exact days of departure and arrival are in most cases undeviatingly adhered to. With sea-birds (for example, puffins), the day of arrival or that on which they appear in certain localities may be prognosticated with perfect safety; and this exact arrival terminates a journey which frequently must have extended over many leagues of sea and land. Similarly, the day of departure appears in some birds (for example, swifts) to be as accurately timed and adhered to; and although less regular than the swifts in their times, the return of the nightingales, swallows, and other migratory birds, is nevertheless of a singularly exact character. There is much that is wonderful and amazing in the consideration of the unerring instincts which, exercised through whatever sense or channel, lead birds to return not only to their exact and former habitats, but to disappear and return at a certain period. Storks have thus been known to return regularly to their old nests; the birds themselves and their respective habitations having been carefully noted. And the same has been observed of the swallows. Even though the surrounding features of the nest may be entirely changed birds will invariably return thereto. A pair of stone-curlews (*Œdicnemus crepitans*)—a species the migratory habits of which are well ascertained, and which inhabit the open country—returned year by year to the same spot and nest, notwithstanding that the spot, from being a rabbit-warren, had 'become the centre of a large and flouriahing plantation.' In these cases the association of former haunts, and especially of the breeding-place, may have powerfully or wholly determined the undeviating return to the accustomed spot. The mode in which birds migrate varies greatly even in the same species of bird. The swallows migrate in bodies comprising vast numbers, and so also do the cranes, wild ducks, and geese, and many other forms; the movements of the cranes being directed by a leader, whose place is successively assumed by other members of the host. The sky-larks arriving on the Norwegian coast at first come in straggling groups; but latterly they fly in large bodies. In some cases, and particularly in the northward movements in spring, the male birds may migrate first, and may arrive at their destination days, or even some weeks before the females. This practice has not been observed to occur in the southward or autumnal flight. The migratory flight is generally made against the wind; and certain species of birds appear to delay their flight for longer or shorter periods when the direction of the wind is unfavourable. The quails thus appear to wait the favouring winds, and to delay their flight by resting on islands when the wind is unfavourable.

Regarding the *causes* of migration, as already remarked, natural history science cannot at present definitely pronounce. The 'instincts' of birds and of other animals may serve to *direct* the flight; but of the ultimate or rather the primary causes which determine or set in operation these instincts, we know absolutely nothing. Probably a combination of causes, or several causes combining in different ways to affect different species, may be looked to for an explanation, rather than any single cause. Thus the scarcity or plenty of *food-supply*, the powerful influences of *temperature*, the presence or absence of certain *physical features* in the conformation of localities, such as mountains, rivers, or seas; the influence of the *breeding-season*, and lastly, the occasional presence of *disease*, may each and all be taken into account as causes influencing more or less powerfully the migration of animal forms. But these causes, assuming their reasonable nature, do not bring us any nearer towards the explanation of the means or instincts whereby birds are enabled to guide their flight to and from—and especially their *return*-flight—their old haunts. That the organs of sense, and those of *sight* in particular, operate in guiding the flights may in a limited sense be true; but this theory does not apply equally or generally. In pigeons Mr. Tegetmeier says the 'homing' faculty is guided by the knowledge of landmarks obtained through sight; but as has been remarked, this 'homing' or visual faculty will not wholly apply to birds flying across whole seas and continents at great heights in the air, and through a journey where the landmarks are faint and few, or where, as in an ocean-journey, none are to be perceived. Mr. A. R. Wallace has suggested that the migration of birds bears a relation to the operations of 'natural selection' and to the 'survival of the fittest' forms. Mr. Wallace says, 'Let us suppose that in any species of migratory bird breeding can as a rule be only safely accomplished in a given area; and further, that during a great part of the rest of the year sufficient food cannot be obtained in that area. It will follow that those birds which do not leave the breeding-area at the proper season will suffer, and ultimately become extinct, which will also be the fate of those which do not leave the feeding-area at the proper time. Now if we suppose that the two areas were (for some remote ancestor of the existing species) coincident, but by geological and climatic changes gradually diverged from each other, we can easily understand how the habit of incipient and partial migration at the proper seasons would at last become hereditary, and so fixed as to be what we term an instinct' (Nature, vol. x. p. 459). Mr. Wallace further says, that every gradation must exist—and would be demonstrated if sufficient observation were brought to bear upon the question—between cases where the breeding and feeding areas are conjoined, and where they are, on the contrary, widely separated; and admitting this primary or hereditary instinct, Mr. Wallace conceives that changes in climate will operate most powerfully in determining the exact *times* at which the two areas will be respectively sought and left. The suggestion as it stands is valuable, even from other than evolutionary points of view, and contains suggestive material for the observation and determination of the dates and areas of migration, and the temperatures of the days when migration takes place.

MILAN (Italian, *Milano;* German, *Mai'and;* Latin, *Medio'anum*), a city in the Kingdom of Italy, capital of the government of its own name, in a beautiful and fertile plain between the Adda and Ticino, which feed several canals, one of which, encircling a considerable portion of the interior of the city, divides it into two unequal parts, while other three on the outside are available both for irrigation and traffic. By railway it is connected with Como, Treviglio, Verona, Venice, Ancona, and Brindisi. The town is built in the form of an irregular polygon, and is surrounded, except on the side which the castle was intended to defend, by a wall or rampart called the Bastione, of little value as a means of defence. All round, just outside the rampart, runs a fine road shaded by chestnut-trees. Suburbs have sprung up beyond this circuit, and the general railway-station is also outside. Though one of the most ancient towns in Lombardy, it has been so often partially destroyed and rebuilt that few antiquities remain; and in consequence of the recent changes cannot fail to be soon altogether modernized. It is entered by eleven gates, several of which are magnificent. The leading streets proceeding from these gates are tolerably wide, well paved, and lighted; the lateral streets, though for the most part clean, are less commodious. The houses are built mostly of brick, but have often a handsome and showy exterior. The principal street in Milan is the Corso Vittorio Emanuele, a prolongation of the new and handsome Corso Venezia, together leading from the cathedral to the Porta Venezia; other good streets are the Corso Porta Romana and Corso Porta Nuova. The squares are scarcely on a scale of equal magnificence. The largest, called the Piazza d'Armi, occupies an immense space, obtained by the demolition of the citadel and its outworks. Part of it has been converted into an amphitheatre, 800 feet long by 400 feet broad, used in summer for races and shows, and capable of containing 30,000 spectators. The castle, now a barrack, fronts the Piazza d'Armi on one side; at the opposite side is the Porta Sempione with the fine Arco Sempione or Arco della Pace. This is a lofty gateway with three passages, built of blocks of white marble, adorned with reliefs and statues, and bearing inscriptions commemorating the emancipation of Italy. The Piazza del Duomo, in front of the cathedral, is the centre of the traffic of Milan.

Among the public edifices of Milan the first place belongs to the Duomo or cathedral, a magnificent structure, inferior in magnitude to St. Peter's at Rome, but in some respects not an unworthy rival. It is built of white marble, and though exhibiting a somewhat incongruous mixture of styles, in which the ancient Gothic occasionally gives way to the modern Italian, is one of the most impressive ecclesiastical edifices in the world. The Duomo in its present form was commenced in 1387, and is not yet entirely completed. Its form is that of a Latin cross, divided into five naves, terminated by an octagonal apsis, and supported by fifty-two octagonal pilasters of uniform size, except four, which, having to bear the cupola, are larger. Around the exterior are 4500 niches, of which above 3000 are already occupied by statues; in the interior everything is of the most imposing and gorgeous description. Among the other remarkable edifices are the church of Sant' Ambrogio, founded by St. Ambrose in 387, and though completely repaired in 1631, still retaining much of its original form, and containing many relics of the ancient building embedded in its walls; the churches of Sant' Eustorgio, San Lorenzo, Santa Maria delle Grazie, with a cupola and sacristy by Bramante, and the celebrated Last Supper by Leonardo da Vinci; Santa Maria della Passione, a majestic edifice, with excellent paintings and a magnificent mausoleum; San Paolo, San Carlo Borromeo, &c. Among the palaces should be mentioned the Palazzo Reale or La Corte, adorned with numerous frescoes and surmounted by a lofty tower; the archiepiscopal palace, adjoining the cathedral; the Palazzo di Comando Militare; the Palazzo Marino, now the Municipio, a colossal structure; the Palazzo Giani, completed in 1861, and adorned with heads of Victor Emmanuel, Garibaldi, &c.; and the Palazzo di Brera or Delle Scienze Lettere ed Arte, containing the Pinacoteca or picture-gallery, with a very valuable collection of paintings and statuary, and containing also the library of the Academy 200,000 vols. Besides this library Milan possesses the Ambrosian Library, the earliest, and still one of the most valuable public libraries in Europe. There is also a valuable museum of natural history, a conservatory of music, a military college, a theological seminary, and a veterinary school. The principal structure erected in recent times is the Galleria Vittorio Emanuele, a kind of covered street connecting the Piazza del Duomo with the Piazza of La Scala Theatre. It was finished in 1867 at a cost of £320,000. It is 320 yards long, contains handsome shops, and is adorned with twenty-four statues of celebrated Italians. Milan has a number of theatres, among which that called La Scala takes precedence, accommodating 3600 spectators. The principal benevolent endowments are the Ospedale Maggiore, richly endowed, and occupying a vast range of buildings in the Gothic style, with accommodation for 2000 patients; several other hospitals for the cure of diseases, or the reception of the poor; and a vast lazaretto just outside the rampart. Since it formed part of United Italy no town has more rapidly increased in commercial and industrial activity than Milan. The spinning and throwing of silk employ a large number of hands. Other important articles of manufacture are tobacco, cotton, lace, carpets, hats, earthenware, white-lead, jewelry, &c. Besides these corn, rice, cheese, and wines are the principal articles of trade. It is the see of an archbishop, the seat of courts of primary resort, criminal and mercantile courts, and a court of appeal for all Lombardy.

The foundation of Milan is attributed to the Insubrian Gauls; but the first distinct notice of it occurs B.C. 221, when it was subdued by the Romans, under whom it acquired so much importance, that in the division of the empire attributed to Constantine the Great it ranks as the second city of Italy. In the middle of the fifth century it was sacked by the Huns under Attila, and again in the following century by the Goths. Greater horrors yet awaited it; and the Goths, who had been driven out by Belisarius, having regained possession by the aid of the Burgundians, gave it up to the flames, and put almost all its inhabitants to the sword. Having been rebuilt it again became very flourishing under the Lombards and Charlemagne. Arrogance grew with its prosperity, and Milan lorded it so haughtily over the neighbouring towns and republics, that in 1162, when the Emperor Frederick I., whose supremacy it refused to acknowledge, had resolved to take summary vengeance, the inhabitants of Pavia, Cremona, Lodi, Como, and Novara eagerly hastened to the task, and razed it to the ground. The cruelties practised produced a reaction, and in 1167 the famous Lombard League was formed at Pontita, and among other important results succeeded in bringing back the Milanese; and the city again rebuilt became even more populous and influential than before. It long continued, however, to be torn by internal factions, headed by the leading nobility, among whom the Visconti at last gained the ascendency, and ruled it from

1395 till 1447. They were succeeded by the Sforzas, whose rule ended in 1535. Milan passed next into the possession of the Spaniards. At the close of the war of Succession it was allotted to Austria (1714). Under Bonaparte it became the capital of the Cisalpine Republic, of the Italian Republic, and of the Italian Kingdom. In 1815 it was restored to Austria, and continued the capital of the Austro-Italian Kingdom until 1859, when by the Peace of Villafranca Lombardy was ceded to Piedmont. Pop., including suburbs, (1881), 295,543.

MILAN, DUCHY OF, or THE MILANESE, formerly a duchy in the north of Italy, one of the finest and most fruitful countries in Europe; bounded on the west by Piedmont and Montferrat, south by the Genoese territory, east by the territories of Parma, Mantua, and Venice, and north by Switzerland. Its extent was 3820 square miles; principal productions, corn, rice, wine, fruits, and silk. The first Duke of Milan was Gian Galeazzo Visconti, who was named to that dignity by the Emperor Wenceslaus in 1395. The duchy was composed of a number of the most flourishing cities of Lombardy, in which the Visconti acquired the sovereignty, partly by means of fiefs and partly through the favour of the citizens and the emperor. The male line of the Visconti became extinct in 1447, and although the rightful claim then fell to France, Francesco Sforza, the husband of a natural daughter of the last duke, obtained possession of Milan for himself and his family, and they held it until the end of the fifteenth century. Louis XII. and his successor, Francis I., then attempting to enforce their claims, the duchy was alternately in the hands of the French and the Sforzas. Francis I., by the Peace of Madrid (1526), was obliged to give up all his Italian possessions; and the male line of the Sforzas having become extinct in 1535, Charles V. granted the duchy to his son, Philip II. of Spain; and it continued to be an appendage to the Spanish crown till the war of the Spanish Succession in 1706, when it came into the possession of Austria. By the Peace of Vienna (1735) and the Convention of Worms (1745) portions of it were ceded to the King of Sardinia. In 1796 the French occupied the country, and by the Peace of Campo Formio (1797) it was annexed to the Cisalpine Republic. The Austrians and Russians annihilated this republic in 1799, but Bonaparte, again become master of Italy, changed the name into the Italian Republic (1801), and into that of Kingdom of Italy (1805), of which the Duchy of Milan formed a part until the events of 1814. Austria then united Milan and Mantua with the Lombardo-Venetian Kingdom, whilst the western portion of the Milanese was incorporated with Sardinia. By the Treaty of Villafranca in 1859 Austria consented to cede to Sardinia the territory lying to the east of the Ticino, and in 1866 the rest of the Lombardo-Venetian Kingdom became part of united Italy.

MILDEW. See FUNGI.

MILE (Latin *mille*, a thousand, a Roman mile being 1000 paces), with the exception of the league the largest terrestrial measure of length. It was originally a Roman measure of 1000 paces, and has been nominally adopted, though with wide variations of the standard, by most European nations. The English statute mile, fixed in the reign of Queen Elizabeth, is 1760 yards. The geographical mile, which is commonly used by the navigators of all nations, is one-sixtieth part of a degree at the equator. The Germans use a geographical mile of one-fifteenth of a degree, or 4 common geographical miles.

The following are some of the principal standards of miles or leagues which are or have been in use in the principal countries of Europe:—

Kilomètre	1,093·6	yards.
Ancient Roman mile	1,614	,,
Modern Roman mile	1,628	,,
English statute mile	1,760	,,
Tuscan mile	1,808	,,
Ancient Scottish mile	1,984	,,
Geographical mile	2,028·4	,,
Italian mile	2,028·4	,,
Irish mile	2,240	,,
French posting league	4,263	,,
Spanish league (judicial)	4,635	,,
French league	4,860	,,
Portuguese league	6,760	,,
German short mile	6,859	,,
Flanders league	6,864	,,
Spanish league (common)	7,416	,,
German geographical mile	8,113·6	,,
German (new imperial)	8,202	,,
Old Prussian mile	8,237	,,
Danish mile	8,244	,,
Swiss mile	9,153	,,
German long mile	10,126	,,
Swedish mile	11,700	,,

MILESIAN TALES. See NOVEL.

MILETUS, an ancient city of Ionia (Asia Minor), situated opposite the mouth of the Meander. It was already a city when the coast of Asia Minor was colonized by the Ionians. It is said by Herodotus to have been inhabited by the Carians. Its early names indicate that it may have been successively occupied by different tribes, among whom were the Leleges.. The Ionians are said to have taken forcible possession of the town, massacred the men, and taken the women as their wives. The town was afterwards rebuilt on a site nearer the sea. The Milesians were considered the purest representatives of the Ionian race in Asia. The extent of the harbours of Miletus, one of which could contain a large fleet, soon raised the town in the hands of the Ionians to a place of importance, and it became one of the first cities of Asia Minor. Its commerce covered the Mediterranean, and extended to the Atlantic. It had upwards of seventy-five colonies, most of which were on the coasts of the Euxine. Like most limited republics its internal history was marked by storms, civil contention, and revolution. It early had a tyrant, and was subsequently divided between aristocratic and democratic factions. On the rise of the Lydian Kingdom repeated attempts were made to conquer it. It finally recognized the sovereignty of Crœsus, and paid tribute. A similar arrangement was made with Cyrus, which saved it the calamities of a contest with the Persians. Civil dissension still continued. The Persians were compelled to intervene, and committed the government to the most peaceable land-owners. The city revolted against the Persians B.C. 500. It was taken by storm B.C. 494, was plundered, and the inhabitants massacred or transported, after which it was given up to the Carians. It recovered its independence in B.C. 479, after the battle of Mycale. It yielded for a time to the supremacy of Athens, but ultimately threw off the yoke. It stood an assault by Alexander the Great B.C. 334, part of the city was destroyed, but the conqueror did not interfere with its government. From the time of its subjugation by the Persians it had never recovered its early importance; but it still continued to enjoy some commercial prosperity under the Romans until the time of St. Paul, who visited it on one of his journeys (Acts xx. 17). It was finally taken and destroyed by the Turks. From the change made on the coast by the deposits of the river the site of the city is now difficult to identify. Many suppose its ruins to be buried in a lake at the foot of Mount Latmus. Some important points as to its ancient position are to be gathered from the various allusions to it contained in Acts xx. 15 to xxi. 1.

MILFORD-HAVEN, a seaport town in Wales, in the county of Pembroke, situated on the north

shore of Milford Haven, 6 miles north-west of the town of Pembroke. Most of the buildings are modern; but the town is of ancient origin, and had once a considerable trade. It now consists of three streets parallel to the shore, and intersected by others at right angles. It is regularly and substantially built of stone, is defended by two forts on the opposite sides of the haven, and by two island forts; and has a custom-house, quarantine establishment, spacious hotel, and good market buildings. The principal branch of industry is ship-building, which is still carried on to some extent, notwithstanding the removal of the royal dockyard. The trade is chiefly in timber imported from America; limestone and culm, sent coastwise; and anthracite, for drying malt, sent in considerable quantities to London and other ports on the English and Bristol Channels. The oysters of the coast are famous for their quality, but the fishery of them is not so active as formerly. Large and convenient docks are in course of construction. Milford-Haven is one of the Pembroke district of parliamentary boroughs, and together with Pembroke, Tenby, Neyland, and Wiston returns a member to Parliament. Pop. 3813.

MILFORD HAVEN, one of the safest, deepest, and most capacious havens in the kingdom, forms a deep indentation in the south-west coast of Pembroke, stretching about 10 miles from east to west, with a breadth of from 1 mile to 2 miles, and branching off into numerous bays, creeks, and roads. The largest vessels can enter or put to sea in any winds or at any tide more expeditiously than from any other large harbour in Great Britain. These advantages early marked out Milford Haven as an important naval depot, and a royal dockyard was actually formed at Milford-Haven in 1790, but the distance of the haven from the Channel, which must always be the great naval thoroughfare, is such a serious disadvantage that the dockyard was removed in 1811, and the Channel ports still continue to maintain the preference.

MILITÄR-GRENZE, or MILITARY FRONTIER, a belt of country in the Austrian dominions, stretching along the frontiers of Turkey from the Adriatic Sea and Dalmatia to Transylvania, and bounded N. by Croatia, Slavonia, Hungary, and Transylvania; and S. by Bosnia, Servia, and Walachia. This military frontier, originally formed about the middle of the sixteenth century by the Emperor Ferdinand I., constituted an administrative division of the Austrian dominions; but after repeated modifications it was in 1881 completely incorporated with the provinces of Croatia, Slavonia, and Hungary. The properties were formerly held as hereditary military fiefs, derived from the state under different conditions of military services, one of which was maintaining a permanent sanitary cordon against Turkey; another duty was that of guarding against the introduction of contraband wares.

MILITARY ORDERS. See ORDERS (MILITARY).

MILITARY SCHOOLS may be divided into two classes—regimental schools, which are common in most modern armies, and which give training in the ordinary branches of education to soldiers and their children; and schools which are intended to prepare pupils for the duties of military service. In the time of Xenophon the Greeks instituted tactical schools in each of their principal towns. The Romans had similar institutions. In European armies the chief school of instruction is the regiment. Up till the time of the French revolution only the special branches—artillery, engineers, sharp-shooters, &c.—received special instructions. Now both soldiers and officers are constantly exercised by systematic drill in the tactical evolutions they may be called on to perform. In the British army an entrance examination before the civil service commissioners has to be passed by Queen's cadets, Indian cadets, pages of honour, before receiving a first appointment. Students at the Universities of Oxford, Cambridge, Durham, London, Dublin, Edinburgh, St. Andrews, Glasgow, Aberdeen, Queen's University, Ireland, who have passed 'moderations' at Oxford, previous examinations at Cambridge, or corresponding examinations at the other universities, are eligible for commissions; lieutenants of militia of two years' standing are eligible after examination; non-commissioned officers who have first-class certificates of education, and quarter-masters recommended for promotion, are eligible after a professional examination. The Royal Military College of Sandhurst is a tactical school, at which the pupils, after a general education, receive one year's training on special military subjects before entering the army. The Royal Military Academy at Woolwich is for training officers for the artillery and engineers. Pupils are admitted at sixteen to eighteen years of age by a competitive examination. Lieutenancies are conferred on those who pass the course of instruction in a satisfactory manner, as evidenced by a test examination. In France the regimental schools include special instruction in various branches of the profession. There are also regimental schools for artillery and engineering. The special schools for preparatory instruction in the higher duties of the profession are under the direction of the minister of war. In Germany all the branches of a military education are also provided in schools specially superintended by the state. The United States' military academy at West Point compares favourably with any institution of the kind in the world.

MILITIA (from the Latin *militia*, 'military service,' and also 'troops'), in the modern adaptation of the word, signifies a body of armed citizens regularly trained, though not in constant service in time of peace, and thereby contradistinguished to *standing armies*. A militia is also distinguished from volunteers, in consisting of local corps raised by requisition of the state. The militia of Great Britain is at present generally obtained by voluntary enlistment, but the contingent of each county is prescribed by statute, and must be raised either by enlistment or by ballot. The origin of the English militia is generally traced back to Alfred. The feudal military tenures succeeded, and although the personal service which this system required degenerated by degrees into pecuniary commutations or aids, the defence of the kingdom was provided for by laws requiring the general arming of the citizens. The raising of militia appears to have been first intrusted to the lords-lieutenant of counties by an act of Philip and Mary passed in 1558. The right of issuing commissions of lieutenancy was denied to Charles I. by the Long Parliament, which took them into its own hands. After the Restoration the sole right of the crown to govern and command the militia was again recognized. The most characteristic features of the militia of Britain used to be that a number of persons in each county were drawn by lot for five years (liable to be prolonged by the circumstance of the militia being called out and embodied), and officered by the lords-lieutenant of the counties and those appointed by them. At present the militia is composed of voluntary recruits, though the ballot can still be enforced; but by the Army Regulation Act of 1871 the jurisdiction of the lords-lieutenant has been vested immediately in the crown. To ensure the efficiency of the force, officers and men are made to undergo one preliminary training for a period not exceeding six (usually limited to about two) months, and after-

wards to a yearly training not exceeding fifty-six (generally twenty-eight days). Infantry militiamen are now formed into battalions, constituting part of the territorial regiment of the locality, of which the regular forces are the senior battalions. Each man enlists for six years, at the expiry of which time he may be re-enlisted for a like period. When called out both officers and men are liable to duty with the regulars; but the area of service does not extend beyond the United Kingdom. See also ARMY, CONSCRIPTION, ENLISTMENT, GARDE NATIONALE, GUARDS, LANDWEHR, VOLUNTEER CORPS, &c.

MILK, the secretion peculiar to the females of the class Mammalia, which is secreted in the mammary glands (which see), and which is employed as the nutritive fluid of the young mammal for a longer or shorter period after its birth. Examined by aid of the microscope, milk is seen to consist of a clear fluid, containing many globules of different sizes floating or suspended in it. The average size of these globules is about $\frac{1}{1000}$ of an inch in diameter. The name of *milk-globules* is applied to these bodies, and each appears to consist of oily matter invested by a thin layer of albumen. In addition to the milk-globules a number of very minute particles, known as *molecules*, are to be perceived suspended in the clear fluid of milk. These molecules are present in most if not all organic fluids, and exhibit certain independent movements, to which the name of molecular movements has been given. In chyle, molecular particles of a similar nature constitute the *molecular basis* of the chyle. When churned, the milk-globules are forced together *en masse*, and form butter. The cream of milk is formed by the larger globules rising to the top of the milk without coalescing; the 'skim'-milk, or that left after the cream is formed, being of a pale bluish colour, owing to its being deprived of its fatty or oily particles. In its chemical composition milk exhibits the presence of the several kinds of nutritive matter necessary for the perfect nourishment of the young animal. In itself, milk thus exhibits the type of a perfect food. The *casein* of milk represents the albuminous or flesh constituents of food; the butter supplies the fatty or oleaginous parts; the water exists as such in milk, whilst it contains the saccharine constituents in the form of milk-sugar, and the inorganic parts in the form of phosphates of lime and alkaline chlorides, so necessary for the production of bone. The following table gives the average chemical composition of the milk of five mammals:—

	Woman.	Cow.	Goat.	Ass.	Bitch.
Water,	88·6	87·4	82·0	90·5	66·3
Butter,	2·6	4·0	4·5	1·4	14·8
Milk-sugar and soluble salts,	4·9	5·0	4·5	6·4	2·9
Casein and insoluble salts,	3·9	3·6	9·0	1·7	16·0

The specific gravity of milk varies from 1·03 to 1·04. The quantity of these various constituents of milk varies greatly at different periods of lactation, and under different circumstances. Thus the casein is present in minimum quantity at the beginning of lactation, and gradually increases thereafter. The sugar, on the other hand, attains its maximum at the commencement of lactation, and decreases afterwards. The mode of life and dietary affects the secretion and constituents of milk in a powerful manner. A certain amount of fatty food thus favours the secretion of butter; rest and warmth also increase the quantity; whilst exercise and cold decrease the proportion of butter in milk. The secretion of casein appears to be favoured by activity and exercise. The first milk secreted by the breasts is known as the *colostrum;* and this milk has a purgative action upon the child, and serves to clear the bowels of the *meconium* or fæcal matter which they contain at birth. In abnormal or unhealthy conditions, the milk may retain the properties of the colostrum for a considerable period; the infant's life being in such a case endangered by the repeated purgation and irritation. The healthy milk of the mother is undoubtedly the best food for the child; and prolonged lactation, on the contrary, is injurious to both mother and child. In about twelve months the milk begins to change in quality, and to assume much of the nature of the early milk. This change therefore indicates that about a year is the average period during which the infant is intended by nature to subsist upon the mother's milk alone. During lactation the menstrual secretion is generally suppressed; the energies of the reproductive system being thus wholly given to the secretion of milk. Among some nations suckling is persisted in for two or three years, and sometimes until another child is born; but the results of such practices are seen in the debilitated state of the mothers, and in the generally early deaths of the parturient women. After the breasts have once secreted milk as the result of pregnancy, the secretion appears never to be wholly suspended—that is, *traces* of the secretion are generally present in the glands. Women who have never borne children, may occasionally exhibit a full functional activity of the breasts; and females in advanced age, who have long passed the parturient epoch, have sometimes possessed a plentiful flow of milk. In mothers also, who from any cause have foregone the duties of lactation, the milk secretion may be restored by the stimulation of the child's mouth in the act of sucking. These facts, curious as they may be considered, are surpassed by the circumstance, well known to physiologists, that the breasts of the male, in man, and in several of the lower mammals, may sometimes become functionally developed, and afford a supply of milk. Dr. Dunglison, in his Human Physiology, relates several such instances of the secretion of milk by the male. These facts show how carefully the evidence presented by the mammary secretion should be received in connection with cases of alleged infanticide, where the presence of the milk-secretion is alleged to form one of the collateral proofs of recent delivery. Of itself, the presence of milk in the breasts will thus constitute no sure or reliable proof that pregnancy has occurred.

The domestic economy of milk exhibits several interesting features for consideration, which may very briefly be noted in the present instance. In the making of butter, cream is allowed to stand for some time, during which an acid is generated. It is then put into a churn and agitated, when the butter gradually separates. Butter is sometimes also made from cream which has not become sour, but the process is much more tedious; the acid formed in the other case favouring the ready separation of the butter. The *butter-milk*, or that left after the separation of the butter by churning, contains the casein, sugar, &c., of the milk; and the milk left after creaming also contains the greater part of the casein and milk-sugar. If the milk be kept for a sufficient time, the sugar is converted into *lactic acid*, and the latter causes the casein to coagulate. Most other acids will cause a like result; but the acid contained in the *rennet* or fourth stomach of the calf is that generally used in the coagulation of milk for domestic purposes. The result of coagulation is to separate the milk into a thin fluid, or *whey*, and a thick whitish deposit, the *curd*. The whey contains most of the sugar and salts of the milk. On this process and its proper performance depends the process of making

cheese, which varies in richness according to the mode followed in preparing it. When milk is heated gradually, and merely to the temperature at which it curdles, and if the curd be freed gently from the whey, it retains almost the whole of the cream, which adds to its richness and flavour. But when it is curdled quickly, and the whey is speedily removed by cutting the curd, a great deal, or nearly the whole of the cream, is carried off, and the cheese is poor, and has not the rich flavour of that made in the other way. In making cheese, having obtained the curd and freed it from its whey, the remaining part of the process is merely to subject it to pressure, by which the whole of the whey is forced out, the colour being communicated by the addition of colouring matter. That generally used is annotta, which is mixed with the milk. Whey has a pleasant taste, and, as already remarked, contains a large quantity of the milk-sugar, hence it is frequently used as drink, and from its nutritious quality it is administered to delicate people; and hence also the use of asses' milk, which contains a large quantity of it. It is from its containing this saccharine matter that whey is sometimes, as in some of the northern counties of Scotland, made to undergo fermentation, by which a very weak spirituous fluid is obtained. By evaporation it affords a minute quantity of saline matter, and a considerable portion of sugar of milk. When whey or milk is exposed to a temperature between 60° and 80°, it undergoes a spontaneous change, attended by the production of an acid, which was originally examined by Scheele, and which is the lactic acid mentioned above.

There is a considerable difference between town and country milk as regards the proportions of the various constituents. The following may be taken as typical analyses of cow's milk (Wanklyn):—

	Water.	Fat.	Casein.	Milk sugar.	Ash.
Country milk,	87·55	3·07	4·04	4·63	0.71
Town milk,	85·93	4·00	5·02	4·31	0·74

As already remarked, milk is the most suitable food for children, and hence great care must be exercised in obtaining it pure. From the ease with which it may be practised the adulteration of milk is carried on to a very great extent. Fortunately the general adulterant is merely water; yet the presence of much water materially decreases the nourishing properties of the milk, and moreover the water may itself be unfit for human use, and so be the means of spreading disease. The amount of added water in a sample of milk may be estimated with a tolerable degree of accuracy by observing (1) the amount of cream yielded by the milk after standing for twelve hours; this should not be less than 8 or 9 per cent.: (2) the specific gravity of the milk after the cream has been removed; this should not be less than 1·034: (3) by estimating the solid matter left on the evaporation of a weighed quantity of the skimmed milk; the amount of solids should not fall below 9·5 per cent.: and (4) by estimating the total solids in the original milk, then treating the dry mass several times with hot ether and again weighing the residue; in this way the percentage of solids not fat in the original milk is obtained; this should not be less than 9·3. The amount of water which is very commonly added to milk varies from 8 to 30 per cent.

Since the passing of the act 23 and 24 Vict. cap. lxxxiv. (1860), which permits the appointment of analysts by cities, boroughs, and quarter-sessions to detect adulteration in articles offered for sale by retailers, milk is not permitted to be sold which does not contain a fair amount of the proper nutritive constituents. It has been held that even milk wholly derived from the cow, if below the standard at which with proper feeding cow milk can reasonably be maintained, is adulterated within the meaning of the act, but no exact standard of purity has been established, and analysts have shown considerable differences in their views as to the latitude which may be allowed.

The trade of supplying milk to large towns has acquired considerable dimensions, and although in London and most large cities considerable dairies are kept, large quantities of country milk are conveyed into them daily by railway from a wide extent of surrounding country. Since the repeal of the corn laws the free importation of grain has tended to raise the price of milk, together with other farm produce, by increasing the demand for it more rapidly than the productive resources of the country have been able to overtake. The Yorkshire cows (short-horn), with which the London dairies are chiefly supplied, frequently yield over 30 quarts of milk a day at the beginning of summer, and their average yield is from 22 to 24 quarts; they are more productive than either the Ayrshire or Devonshire, though these, particularly the Devonshire, yield a milk richer in butter.

Various processes have been adopted for condensing and preserving milk. Moore's *essence* is prepared by heating the milk in shallow copper pans to 110° Fahr., adding a little sugar and stirring for several hours until it loses three-fourths of its weight by evaporation. It is then put into small tins, which are soldered and allowed to cool. Blatchford's solidified milk is made by mixing milk with one-fourth by weight of sugar and a small quantity of bicarbonate of soda, heating it in pans by steam until it is converted by evaporation into a creamy powder. It is then solidified by pressure into cakes of 1 lb. weight. More recently an American Company in Switzerland, the Aylesford Company in England, and other companies on the Continent, have manufactured condensed milk according to a recipe of Professor Liebig. It is mixed with a considerable quantity of sugar, and on being diluted with four or five times its bulk in water resembles pure milk sweetened with sugar.

MILK-FEVER, a febrile state sometimes induced when the milk begins to be secreted after parturition. It is a morbid aggravation of the local and general excitement attendant on the commencement of lactation. The febrile symptoms are ushered in by chills or rigour. It is accompanied with severe pains and throbbing in the head, flushing in the face, thirst, heat and dryness of skin. The pulse is full, the tongue furred, bowels costive, urine scanty, and light and sound are painful. It is frequently induced by over stimulating diet. The treatment consists in cooling saline purgatives, good ventilation and moderate temperature in apartments, and encouraging the free flow of milk. It may thus be subdued in a few hours, but if not taken promptly may lead to aggravated and dangerous disease. Milk-fever attacks the lower animals, whether from cold and exposure or from over-stimulating diet. Cows are frequently exposed to it from this cause. It is best prevented by unstimulating diet, and by milking the cow regularly ten days before calving.

MILK-TREE. See COW-TREES.

MILKY-WAY. See GALAXY.

MILL, originally a machine adapted to divide, crush, or pulverize any substance; but more extensively applied in modern times to almost all machinery consisting of wheel-work, whether intended to change the form or merely the position of the substance operated upon. The term as thus used is very indefinite, both in regard to the moving power and the application of the power or the process. Mills therefore take different names, from the pro-

cess, as stamping-mills, saw-mills, fulling-mills, grinding-mills, &c.; from the moving power, as wind-mills, water-mills, hand-mills, steam-mills, &c.; or from the material operated on, as cotton-mills, flour-mills, sugar-mills, oil-mills, &c. This great variety in the nature and uses of mills renders it impossible to give descriptions of them under one head. We shall here speak only of corn-mills. One of the earliest and most universal applications of machinery of this kind is to the comminution of grain. Among the rudest nations we find this done by pounding it between two stones; but with the first advances of art a simple hand-mill is constructed, composed of an immovable nether-stone, and an upper-stone put in motion by the hand. These machines were used by the Hebrews and Greeks, and commonly moved by slaves or criminals. Asses were afterwards employed. According to the Greek mythology Pilumnus, Myles, or Mylantes invented the mill. Water-mills (*molæ aquariæ*) seem to have been used by the Romans. Wind-mills were invented in the time of Augustus. Among the moderns the common mill for grinding grain is constructed with two circular stones placed horizontally. Burr-stone, or buhr-stone, a silicious stone of a cellular texture, is the best material of which mill-stones are made, but syenite and granite are frequently used. The lower stone is fixed, while the upper one revolves with considerable velocity, and is supported by an axis passing through the lower stone, the distance between the two being capable of adjustment according to the fineness which it is intended to produce in the meal or flour. When the diameter is 5 feet the stone may make about ninety revolutions in a minute without the flour becoming too much heated. The corn or grain is shaken out of a hopper by means of projections from the revolving axis, which give to its lower part, or feeder, a vibrating motion. The lower stone is slightly convex, and the upper one somewhat more concave, so that the corn, which enters at the middle of the stone, passes outward for a short distance before it begins to be ground. After being reduced to powder it is discharged at the circumference, its escape being favoured by the centrifugal force, and by the convexity of the lower stone. The surface of the stones is cut into groves, in order to make them act more readily and effectually on the corn; and these groves are cut obliquely that they may assist the escape of the meal by throwing it outward. The operation of *bolting*, by which the flour is separated from the bran or coarser particles, is performed by a cylindrical sieve placed in an inclined position and turned by machinery. The fineness of flour is said to be greatest when the bran has not been too much subdivided, so that it may be more readily separated by bolting. This takes place when the grinding has been performed more by the action of the particles upon each other than by the grit of the stone. For this sort of grinding the burr-stone is peculiarly suited. The patent improvements of Evans consist of a series of machines calculated to save hand-labour, by performing every movement of the grain and meal from one part of the mill to another, or from one machine to another, by the force of the water.

MILL, JAMES, historian, philosopher, and economist, was born in the parish of Logie Pert, Forfarshire, on the 6th April, 1773. He received the early part of his education at the grammar-school of Montrose, and was afterwards, through the patronage of Sir John Stuart, Bart., of Fettercairn, on whose estate his father held a small farm, sent to the University of Edinburgh, where he was educated for the church. On completing the regular course he was licensed as a preacher, but having adopted views opposed to any positive system of theology he abandoned the clerical profession. In 1800 he accompanied Sir John Stuart to London, where he settled, and supported himself entirely by his pen. For several years he was a contributor to the Edinburgh Review, the British, the Eclectic, and Monthly Reviews. He was also the editor for some time of the Literary Journal, and contributed largely to the Philanthropist, a Quaker periodical. His History of British India, to the collection of materials for which he had long devoted himself, was commenced about 1806, and published in the winter of 1817–18. It first appeared in three vols. 4to, and afterwards in five vols. 8vo. The narrative is contained in six books, beginning with the commencement of British intercourse with India, and ends with the conclusion of the Mahratta war in 1805. It was the first Anglo-Indian history based on solid information, and the difficulties with which Mill had to contend as the pioneer of Indian historians, especially as he was unacquainted with the native languages, were of a most formidable kind. Up till the time of the appearance of his history Mill had only been able by his literary by-work to earn about £300 a year, on which he had to maintain a family, but this great work did not remain unrewarded. The East India Company deemed his knowledge of affairs too valuable to be neglected, and in 1819 he was appointed to the second situation in the examiner's office, and soon after appointed chief examiner. The duties of this office were to prepare despatches and state papers, and to correspond with the Indian government in the department of revenue. His official duties, however, did not prevent him from continuing to exercise his pen. He contributed to the Edinburgh, Westminster, and London Reviews, and wrote a number of valuable articles to the Supplement to the Encyclopædia Britannica. In 1821–22 he published his Elements of Political Economy, a summary of the leading doctrines of that science, according to Smith and Ricardo. In 1829 he published his Analysis of the Phenomena of the Human Mind, in which he follows up the doctrine of Hartley, a work upon which he had bestowed extraordinary labour, and in which he evinced great analytical powers. In 1835 he published anonymously a Fragment on Mackintosh, in which he criticizes Sir James Mackintosh's Dissertation on the History of Ethical Philosophy. Mr. Mill belonged to the Radical party in politics, and wrote many of the principal articles in the Westminster Review. The celebrated articles on the Formation of Opinions in No. xi., and on the Ballot in No. xxv., were by him. He died 23d of June, 1836. Mill associated with the most distinguished literary men of his party, Bentham, Brougham, Romilly, Ricardo, and others. His advice was freely sought by literary aspirants, in whose career he manifested a sustained interest, and in this as in his social capacity he exercised considerable influence on the formation of public opinion. He was, in the opinion of MacCulloch, one of the ablest exponents of the utilitarian school in political economy. Besides his Elements he wrote an Essay on the Impolicy of a Bounty on the Exportation of Corn (London, 1804); Commerce Defended (1807). His history is highly commended by critics for the extent of historical knowledge, the mastery of facts, and the insight into the causes of events which it displays. Some critics praise it for clearness and terseness of style. On the other hand the want of descriptive and narrative power, and more serious defects of style, amounting at times to obscurity and inaccuracy, are charged against it. The impartiality of the historian is also called in question, and he is accused of having made his whole work the medium of an elaborate philippic against the entire policy of the East India Company. In philosophy Mill was a follower of the

school of Hobbes and Bentham. His essays on Government, Jurisprudence, Liberty of the Press, Prison and Prison Discipline, Colonies, Law of Nations, and Education (reprinted from the Supplement to the Encyclopædia Britannica, 1828, for private circulation) led to a controversy between Lord Macaulay in the Edinburgh Review, and Jeremy Bentham in the Westminster. These articles (Edinburgh Review, June and October, 1829) do not appear in Lord Macaulay's collected works. Mill's Principles of Toleration appeared in 1837.

MILL, JOHN STUART, philosopher and political economist, son of James Mill, was born in London, 20th May, 1806; died at Avignon, 9th May, 1873. All his studies, in which he showed remarkable precocity, were conducted under the superintendence of his father, and under the paternal roof. In 1820 he visited Paris, where he resided with the economist J. B. Say, and before returning to England he spent some months in the south of France. In 1823 he entered the East India Company's service as clerk in the examiner's office, and for thirty-three years he continued in the political department of the office, that connected with the transactions of the Company with native states. He formed, at the commencement of this period, an intimate acquaintance with the banker and historian George Grote. He also acquired the confidence of Bentham, his father's friend, whose opinions he adopted, and was selected by him to superintend the publication of his work on the Rationale of Evidence, which appeared in 1827, with notes and several supplementary chapters by J. S. Mill. From this time he became a regular and assiduous contributor to the Westminster Review. From 1835 to 1840 he became editor and part proprietor of the London and Westminster Review, in which many of his own articles appeared. His System of Logic, Ratiocinative and Inductive, appeared in 1843; Essays on Some Unsettled Questions of Political Economy in 1844; Principles of Political Economy, 1848; Liberty, 1859; Considerations on Representative Government, 1861; Utilitarianism, 1862; An Examination of Sir William Hamilton's Philosophy, and Auguste Comte and Positivism, 1865; Dissertations and Discussions, Political, Philosophical, and Historical, 1867; the Subjection of Woman, 1869; Programme of the Land Tenure Association, 1871. His Autobiography was published after his death. A posthumous work containing three essays on Nature, the Utility of Religion, and Theism, was published in October, 1874.

In the service of the East India Company he rose from grade to grade till he succeeded, in 1856, to the position held by his father as chief examiner. He drew up in 1858 the petition of the Company against the transference of the government of India from the Company to the crown. He declined a seat in the new India Council, and retired with a compensating pension. In 1865 he was elected member of Parliament for Westminster, but he proved too philosophical and independent in his political views to be a serviceable dependent of the Liberal party, and despite his incisive logic, he wanted both the popular eloquence and the personal qualities to make himself a leader. He opposed the ballot, supported Hare's scheme for the representation of minorities, and advocated the representation of women. By these and similar courses he acquired, independently of the soundness or unsoundness of his opinions, a reputation for somewhat crotchety independence. Hence in 1868 he lost his election. After this he lived in private, spending a considerable part of his time at Avignon. In 1851 he married Harriet Taylor, a widow, with whom he had lived on terms of intimate friendship during her husband's life. He had no children.

John Stuart Mill was a positivist in his philosophy, inasmuch as he adopted some of the leading principles of Auguste Comte, but in its historical relations as well as in its fundamental principles, his philosophy does not belong to positivism, but to the school of speculative empiricism, successively and variously developed by Locke, Berkeley, Hume, Hartley, and James Mill, the aim of which is to establish a psychology on the basis of experience and in alliance with the natural sciences. In his Examination of Sir William Hamilton's Philosophy he adopts the view of Berkeley and Hume that the absolute distinction popularly conceived to exist between Mind and Matter, and maintained by the Scotch realistic school from Reid to Hamilton, has no existence; and he defines matter as a permanent possibility of sensations, and mind as a series of actual, and the base of possible states of consciousness. His system of logic, which is so intimately associated with his metaphysics, has been already noticed in our article Logic. His differences with Auguste Comte, shown in Auguste Comte and Positivism, are too recondite, and demand a knowledge of the details of their respective systems too intimate to admit of their being satisfactorily summarized. One point, however, is worthy of being noted. Mill refuses to admit that positivism excludes the supernatural. He holds that the positive mode of thinking is not necessarily a negation of the supernatural. It merely refers back that question to the origin of all things. If the universe has had a commencement it must by the conditions of the case be supernatural, for the laws of nature cannot render an account of their own origin. Positive philosophy is free to form its opinions on this subject according to the weight which it attaches to the analogies which are called evidences of design, and to the general traditions of the human race. The value of these proofs is not a subject on which positive philosophers need necessarily agree. The positive mode of thinking, according to him, consists in believing in the constancy of the succession of antecedents and consequents in the existing order of the universe, and in the exclusion of supernatural or providential interference with this order, and a positivist may consistently conceive this order to have been originated by an intelligent being. Mill's views on morals are developed in his work on utilitarianism. He is a follower of Bentham, whose principles he develops with some original views. He introduces a distinction, like Epicurus, between superior and inferior pleasures; founds justice on the natural principle of vengeance, whose function it is to protect certain utilities more absolute and imperative than others; he makes the moral sense arise through the association of ideas into a seeming independence of its utilitarian root, in a manner analogous to the creation of conscience by Mackintosh.

As a politician he belonged to the sect of philosophical radicals, a body whose somewhat undefined creed admits of a combination of democratic and conservative notions in any proportions. He was a great admirer of the constitution of the East India Company, and in his Representative Government he represents the councils of the governor-general and lieutenant-governors of India as one of the few instances of the happy adaptation of means to end which political history affords. In this work he insists on the necessity of various checks to modify the license of extreme democracy, a council of the usual size of a cabinet council to take the initiative in the formation of laws, and a representative body to pass them, in electing which minorities are to be represented, and a double vote given to those whose functions indicate superior intelligence. In his Liberty he asserts the rights of individual liberty against the tyranny of social

opinion. In this work he takes as his unit the individual man arrived at the age of full intelligence, leaving out of view the effects upon individual liberty of the previous control and discipline of family life, and omitting to consider the important bearing upon social liberty of the organization of the true unit of society, the family.

As an economist Mill occupied a double and somewhat conflicting position. In his Principles of Political Economy he assumes the position of a logical exponent of the principles of the utilitarian school of Adam Smith, Ricardo, and James Mill, founded on the orthodox doctrine of proprietary rights, but he was by no means an unquestioning adherent of this doctrine, and his philanthropic and socialistic theories were often at variance with the apparent results of the system he had chosen to expound. Thus economy as a science based on proprietary rights has gained little from Mill's exposition. It is needless to discuss the merits of his work in this respect; but it may be said that while he often indulges in acute criticism of his predecessors, and suggests with more or less accuracy numerous emendations on their propositions, there is apparent in it an incapacity to grasp the higher generalizations of the science, which is easily explicable by the pre-occupation of his views, and the reluctant homage he yields to its first principles. It is in fact in encroachments on the orthodox principles of economy that any powers of generalization which Mill has shown in connection with this subject have been displayed. His theories touched the fundamental principles of economy at several points. In regard to the doctrine of proprietary rights he drew a distinction between landed and movable property. The soil he held to be the inalienable property of the community, and individual property in it to be a right held contingently on the consent of the state. He divided the revenue of such property into two parts, the remuneration of capital, and the price of monopoly; the latter of which, he held, belonged to the state, and ought to be exacted in the form of taxation. The socialistic principle of the right of labour he did not consider it reasonable absolutely to repel. He perceived that it was impracticable for the state to affirm the right of labour with any practical effect, that is, to give employment at remunerative wages, as long as the number of labourers was liable to indefinite increase; but he held that it was possible for the state to guarantee employment provided it took the multiplication of the people under its control, and he believed that public opinion might be so educated that the restriction against undue multiplication might be made a legal one. In regard to the organization of labour he favoured the principle of co-operation, 'the association of the labourers themselves on the terms of equality, collectively owning the capital with which they carry on their operations, and working under managers elected and removable by themselves' (Political Economy, bk. iv. ch. vii. sec. 6), which he believed to be ultimately destined to predominate if mankind continued to improve.

MILLAU, a town of France, in the department of Aveyron, in a rich valley, near the confluence of the Dourbie with the Tarn, 31 miles south-east of Rodez. It is surrounded by steep rocks, has one wide street and a large square, but most of the other streets are very confined, though in general straight and lined with well-built houses. It has coal mines, manufactures of leather, leather gloves, and articles in chamois; several silk-mills, and a trade in wool, raw and spun; leather, wood for carpentry and shipbuilding; cheese of Roquefort, wine, almonds, cattle, &c. Millau possesses courts of first resort and commerce, a chamber of commerce, agricultural society, and communal college. It was long one of the strongholds of the Protestants. Pop. (1881), 16,628.

MILLEDGEVILLE, a town of the United States, in the State of Georgia, capital of Baldwin County, 145 miles north-west of Savannah, on the right bank of the Oconee, here crossed by a bridge, at the junction of Fishing Creek, and at the head of steamboat navigation. It is regularly laid out, the principal streets being parallel with the river, and crossed by others at right angles; and has three spacious squares, a handsome court-house in the Gothic style, market-house, lunatic asylum, penitentiary, three churches, and an academy. Pop. 3500.

MILLENNIUM (Latin, *mille*, a thousand, and *annus*, a year), the name given to an anticipated period in the future history of the world, the belief in which, founded on various passages of Scripture, is widely diffused in the Christian Church. The term millennium itself is specifically founded on a particular passage in the Apocalypse (Rev. xx. 1–7), in which the period to which it is referred is specifically described. The 'thousand years' there mentioned is by some taken literally, by others supposed to refer to an indefinitely long period. This period is placed immediately, or at a brief interval, before the general judgment.

The millennium corresponds in some respects with the golden age of heathen mythology. It differs in being future, and in being more distinctly founded on moral reformation. The golden age was a period of primitive innocence, prosperity, and peace; the millennium is the earthly culmination of Christianity. There are throughout the canonical books of the Old Testament numerous predictions of a period when righteousness, with peace and prosperity as their results, should prevail on the earth. The promise originally made to Abraham (Gen. xii. 3); the blessing of Isaac to Jacob, and of Jacob to his sons; many of the Psalms, and numerous passages in the prophecies of Isaiah, Jeremiah, Ezekiel, and the minor prophets, refer more or less directly, and sometimes in language eloquently descriptive, to such an expectation. But the passages in the Old Testament which bear the closest resemblance to the predictions of the Apocalypse are the prophetic portions of the book of Daniel. In Daniel ii. 44 the setting up of a kingdom by the God of heaven which should never be destroyed is expressly predicted, and the visions of the seventh and twelfth chapters of Daniel read like an epitome of the visions of St. John. In the New Testament the same strain of anticipation is found in numerous passages besides the Apocalypse. The regenerative power of Christianity is dwelt upon especially by St. Paul, who discusses it in his various epistles with the reasoning of a philosopher rather than with the anticipations of a seer. These predictions, especially those of the Pauline epistles (such as Ephesians i. 10), have always been held by many divines and Christians to refer exclusively to a future state, but others have been of a different opinion, and the whole current of such prophetic passages has tended greatly to strengthen the belief in a period of earthly prosperity, founded more directly on the visions of Daniel and St. John.

Among those who hold the doctrine of a millennium, besides innumerable shades of diversity, one broad and irreconcilable difference of opinion has entered, and has divided them into two perfectly distinct classes. The one hold that the millennium is to be preceded, the second that it is to be followed by the second coming of Christ. The second class hold the language of the prediction to be figurative, and refer it to the general diffusion and triumphant reign of Christianity which is to prevail until a short time before the last judgment, when a general

declension is to reproduce the horrors of war and persecution upon the closing scenes of the world's history.

The other opinion, which makes the second coming of Christ precede the general judgment, is that which prevailed in the early church. Those who held it were called Chiliasts, from the Greek *chilias*, a thousand; in later times they have been more commonly designated as Millenarians. While differing much in the details of their views their general doctrine was that the coming of Christ was to be attended with a first resurrection, in which only the martyrs, those who were worthy of the martyr's crown, or all the just (the last view was held by Justin), were to participate. These were to share in the personal reign of Christ upon the earth, and in the free enjoyment of intercourse and communion with heaven and the heavenly beings. This period was to be followed by the general resurrection of the dead. The views of the Chiliasts have probably suffered some distortion from being chiefly represented by their opponents, who finally triumphed in the church. Some of the statements of Eusebius about them are evidently charged with exaggeration, and the names of those who held the Chiliast doctrine are a sufficient refutation of the grosser charges brought against them. Among its supporters may be reckoned Papias, Justin, Irenæus, Tertullian, Nepos, Victorinus, Lactantius, Cyprian. One of the earliest charges brought against the Chiliasts was that of judaizing, and this has been repeated by modern opponents of the doctrine with a complete misapprehension of its meaning, the Chiliast doctrine, or even the doctrine of a millennium itself, being ascribed to a Jewish origin in contradistinction to a Christian one. This could not be the meaning of the early opponents of the Chiliasts, who were well aware of the origin of the doctrine as founded on a literal interpretation of recognized scriptures; but they charged their opponents with Judaizing in giving a literal interpretation to these scriptures, while the orthodox or Christian interpretation, according to them, was spiritual. This charge was enforced by the fact that the Jews themselves had a millennium, which is recognized in the Talmud and other traditional writings, and which is evidently derived from a common source with the Christian one, the earlier Scriptures recognized by both, as the books of Moses (Deut. xxx.), Isaiah, and Ezekiel. Thus Nepos, who was a bishop of Egypt in the reign of Gallienus (260–268), and the author of a work entitled Refutation of the Allegorists, says that the Scriptures should be understood as the Jews understood them. The other principal charge brought against the Millenarians was that of sensualism. Eusebius says of Nepos that he supposed there would be a certain millennium of sensual luxury on this earth. This charge was also probably originally made in a very different sense from that in which it is now liable to be understood. It is to be remembered that those who made it were in the habit of *spiritualizing* or symbolizing all the promises of Scripture conveyed in terms descriptive of worldly prosperity. The true import of the charge is probably to be found in the statement of Dionysius of Alexandria, the opponent of Nepos, that they taught their brethren to expect what is little and perishable, and such a state of things as now exists in the kingdom of God. The pleasures of eating and drinking and the social enjoyments of a marriage-feast are the Scripture imagery employed to represent the joys of the millennium. A literal interpretation of such imagery is of course liable to abuse, and it was probably attended with abuses among the more inconsiderate followers of the serious advocates of this view in earlier as it has been in later times, but the charge of countenancing such abuses was probably never intended to be brought against the leading Chiliasts. Justin excludes sexual pleasures from the millennium on the authority of Luke xx. 34. The origin of the Chiliast doctrine is very commonly attributed to Papias, the reputed disciple of St. John. It was generally prevalent in the time of Justin. Its leading opponents subsequently were Origen, Jerome, and Augustine. It was adopted by such opposite sects as the Marcionites and the Montanists, but was finally condemned and rejected by the orthodox church, and with the ascendency of Papal authority died away and disappeared. An apparent revival, though inconsistent with the cardinal principle of Chiliasm, which places the second coming of Christ before the millennium, occurred in the tenth century, when a general panic overspread Europe from the supposition that the millennium, dating from Christ's first coming, was over, and that the general judgment was at hand. In 1524 a millennarian work entitled Onus Ecclesiæ, was published *cum approbatione superiorum*. The doctrine revived again at the Reformation. It was seized upon by the Anabaptists, and made the pretext for their excesses. It was consequently discredited among the reformers, but it reappears in the Catechism of Edward VI. (1553), where it is distinctly taught. It was again abused at an after period by the Fifth Monarchy men. It has never prevailed among the Protestant churches, but has since the Reformation numbered among its advocates, especially in England, individual names of great distinction, such as Mede, Clayton, Bickersteth, and Alford: on the Continent it has been supported by Bengel, Pierre Jean Agier, and others. The Mormons have adopted the millenarian theory, and it may be observed that many of the French socialists, who profess little regard for the inspiration or authority of Scripture, have found in the Apocalypse, as in other parts of the New Testament, sentiments and anticipations congenial to their principles.

The view of the millennium which anticipates a spiritual reign of Christ on earth is of comparatively modern development. Among Protestant divines it is commonly associated with the expectation of the simultaneous overthrow of Popery and Mohammedanism, which is to precede the millennium. It is also frequently supposed that it will be ushered in by the national conversion of the Jews and their restoration to their own land, in accordance with the statement of St. Paul in Romans xi. 26 and other scriptural announcements. The divines who form these expectations generally calculate the duration of the Papal and Mohammedan dominions by allowing a year for each day of the duration assigned in the prophecies of Daniel and the Apocalypse to the powers with which they are identified. A speculation which has been associated with this mode of interpretation may perhaps have some interest for geologists and philanthropists. As the period assigned to the persecution of the church (Rev. xii. 6) is 1260 days, and of its triumph a thousand years, it is assumed by some critics that the latter period will exceed the former by the proportion of something like 1000 to 3½ years. A period called the slaying of the witnesses, to which in the Apocalypse 3½ days is assigned (Rev. xi. 7–9), is supposed to intervene between the fall of the Papal dominion (the beast and his image) and the commencement of the millennium. A complete history of millennarianism is still a desideratum.

MILLEPEDE (*Julus*), the type of the Chilognatha, the second order of the class Myriapoda, which class also includes the familiar Centipedes. The Millepedes, popularly known as 'hairy-worms'

or 'thousand-legs,' are worm-like in form, and attain but a small size in Britain, although some foreign species may measure over 6 inches in length. Each segment of the body, except a few of the front joints, bears two pairs of legs—the joints in the nearly-related centipedes bearing each one pair only. The common species (*Julus terrestris*) is found in damp places, concealed under stones, or under the bark of trees. These forms appear to subsist on decaying animal and vegetable substances. The body consists of from forty to fifty joints, protected externally by a horny exoskeleton or skin, and when irritated or alarmed, or when at rest, these animals have the power of coiling up their body in a spiral form, the feet being concealed within the inner aspect or concavity of the spire. The mouth is provided with a pair of strong jaws or 'mandibles;' and the antennæ or feelers consist of six or seven joints. The sexual orifices open at the base of the seventh pair of legs in the male; and in the female in the neighbourhood of the head. No metamorphosis occurs in these forms, but successive moultings of the skin take place during the period of early growth. See MYRIAPODA. (Pl. LXIX.–LXX. fig. 47.)

MILLEPORA, the type of a family of Sclerodermic (*Tabulate*) Corals, in which the coral-substance is arranged in a closely-set porous manner. The entire coral structure of millepores is generally of a massive or foliaceous kind, the *septa*, or internal vertical divisions of the individual polypes being few in number. The *tabulæ* or transverse divisions of the coral polypes are, however, represented in a very perfect manner. The *Millepora moniliformis* is one of the best known species; and the *M. alcicornis* is also a familiar millepore.

MILLER, HUGH, a Scottish geologist, was born in Cromarty, October 10, 1802. His father, the master and owner of a small coasting-vessel, was lost in 1807 in a storm at sea, a fate which had befallen several of his ancestors; and the care of the son devolved upon his mother, although the influence of two maternal uncles probably produced a more permanent impression upon his character and habits than that of any other person. One of them encouraged his early bent towards natural history, and the other imbued his mind with a love for traditional lore and the observation of human character and social peculiarities. In the school at Cromarty he received the ordinary elements of education, and began Latin with a view to college, but failed in it from distaste, although he read with avidity English translations of the classic authors. He read, indeed, every book that came in his way, and before his eleventh year had run through a very miscellaneous course, including fiction, poetry, history, voyages and travels, and writings on Scottish martyrology. He was in the habit of reproducing the stories he had read in the form of narratives to his school-fellows; and when he exhausted his books in this way, had recourse to his imagination, extemporizing with ease tales of exciting personal adventure. About the age of seventeen he had become acquainted with the British essayists, the plays of Shakspere, the poetry of Pope, and the writings of the wits of Queen Anne's time, the study of which formed the basis of his own pure and fluent English style. He had begun to write verses, and what was of greater importance to his future success in life, to observe and collect natural objects, acquainting himself more particularly with the structure and relations of the rocks in his neighbourhood. His friends were still desirous that he should study for the church, but Hugh declared that he had no call to the sacred office. He was then apprenticed to one of his relatives as a mason; and from his seventeenth to his thirty-fourth year he followed that employment, often in distant parts of the country, but everywhere exercising his faculties of observation, and availing himself of every hour of leisure for reading and mental cultivation. During this laborious period of his life, while living on humble fare, and often deprived of domestic comfort and accommodation, he studied systematically the best British authors in literature and philosophy, including the volumes of Locke, Kames, Hume, Reid, Adam Smith, and Dugald Stewart. In the meantime he was working his unaided way to an accurate knowledge of rocks and fossils, and the productions of living nature. Some of his earliest and most important observations in geology were made while he was toiling in the quarry; and his leisure walks among the natural sections of the rocks in the neighbourhood of Cromarty afforded him opportunities of enlarging his view of their fossil contents and superposition. The same habit of patient research he carried with him in all his wanderings as a stonemason, from the shores of the Moray Frith to those of the Frith of Forth. His various scenes of labour made him acquainted also with the scenery, antiquities, and social peculiarities of different parts of Scotland. In 1825, when work was failing in the north, he proceeded to Edinburgh, where he followed his humble avocation for two years; but losing his health, he returned to Cromarty, where he soon became a local celebrity, and was engaged in correspondence with geologists in different parts of the kingdom. In 1829 he published a volume of poems, 'written in the leisure-hours of a journeyman mason;' and contributed letters to the Inverness Courier on the herring-fishery, which were afterwards published in a collected form. He was at length enabled to exchange manual labour for the occupation of an accountant in a branch bank at Cromarty. Shortly after he entered into the marriage state; and during the first two years of his new office he published his Scenes and Legends of the North of Scotland, and became a contributor to Chambers' Journal and other periodicals. After his return from Edinburgh the state of his health had led him to the serious consideration of his spiritual condition, and a permanent change was now wrought upon his character and prospects. The non-intrusion controversy in the Scottish Establishment having deeply interested him, he took advantage of the adverse decision of the House of Lords in the celebrated Auchterarder case to address a letter to Lord Brougham on the subject of the church's claims, the style and spirit of which production pointed him out to the projectors of the Witness newspaper in Edinburgh as being qualified in an eminent degree for being its editor. His appointment took place in 1840, when he removed to Edinburgh, where his paper assumed not only a leading and influential part in the controversy which had called it into being, but rose at once to the highest rank in Scottish journalism. Besides his leading articles on the political, ecclesiastical, and general topics of the day, he enriched the columns of the Witness by the successive chapters of geological investigation and discovery, which in their collected form appeared subsequently under the title of The Old Red Sandstone, or New Walks in an Old Field. The value of this contribution to the rising science was acknowledged in the most unreserved manner by geologists of the standing of Buckland, Murchison, Lyell, and Agassiz, who, at the Glasgow meeting of the British Association in 1840, warmly eulogized the originality of Miller's researches and the picturesque elegance of his style. The right of the old red sandstone to rank as a distinct formation in virtue of its peculiar fossils had scarcely been recognized up till this time; and next to Sir Roderick

Murchison, the honour of establishing its character as a separate geologic system (now named the Devonian) unquestionably belongs to Hugh Miller, whose researches into the ichthyology of the period threw new light upon its hitherto obscure history, and constitute his chief title to the distinction assigned to him amongst the geologists of the day. The disruption of the Established Church took place in 1843, in which Miller had taken an active share in guiding the counsels of the church, in uniting the people, and preparing them for the coming crisis. A work called the Vestiges of the Natural History of Creation having excited a high degree of attention in the public mind, Miller replied to it in the Footprints of the Creator, or the Asterolepis of Stromness, a work of profound thought and ingenuity, only too philosophic in its details and reasonings to serve the purpose of a popular treatise. An excursion to England for the benefit of his health, now impaired by a life of incessant brain-work, resulted in the publication of his First Impressions of England and its People. Subsequently appeared My Schools and Schoolmasters, an autobiographical sketch of the author's history till the time of his settlement in Edinburgh. His last work was the Testimony of the Rocks, in which the author undertook to reconcile the apparent discrepancies between the interpretation of the Mosaic cosmogony and the discoveries of geological science. The writer had previously enunciated his views on this subject in a lecture delivered in London. He had just given the finishing stroke to the work in its passage through the press when his over-tasked brain gave way, and in a paroxysm of cerebral excitement he died by his own hand at Portobello, near Edinburgh, on the 26th of December, 1856, aged fifty-four. The Cruise of the Betsey, or a Summer Holiday in Hebrides, and Rambles of a Geologist, or Ten Thousand Miles over the Fossiliferous Deposits of Scotland, were published after his death. His works also embrace the following volumes:—Essays Historical and Critical; Tales and Sketches; the Headship of Christ; Edinburgh and its Neighbourhood, Geological and Historical; and leading articles reprinted from the Witness. His collection of fossils, partly by public subscription and partly by a grant from government, was purchased from the family, and is preserved in the University of Edinburgh. At Cromarty his fame is commemorated by a monument, which, on the suggestion of his friend Sir Roderick Murchison, was built of the old red sandstone.

MILLER, Joseph, a witty actor, whose name has become proverbial in the English language, was born in 1684, it is supposed in London, and was a favourite low comedian about the time that Congreve's comedies were fashionable, to the success of which, it is said, his humour much contributed. In these he performed Sir Joseph Wittol in the Old Bachelor, and Ben in Love for Love. Another of his favourite characters was Teague, in the Committee. He died in 1738. The jests which have immortalized his name were collected in 1738, by John Mottley, author of the life of Peter the Great, and other works. Joe Miller's Jests had run through eleven editions up to 1751. They have since gone through almost innumerable editions, increased by large additions of modern jests, and modified to suit the growing fastidiousness of public taste. A lithographic fac-simile of the first edition, which is very rare, was published in 1861. The title is Joe Miller's Jests, or the Wits' Vade Mecum; being a collection of the most brilliant jests, the Politest Repartees, the most elegant Bon-Mots, and most pleasant Short Stories in the English language. First carefully collected in the company, and many of them transcribed from the mouth of the facetious gentleman whose name they bear; and now set forth and published by his lamentable friend and former companion, Elijah Jenkins, Esq. (Mottley), most humbly inscribed to those choice spirits of the age, Captain Bodens, Mr. Alexander Pope, Mr. Professor Lacy, Mr. Orator Henley, and Job Baker, the kettledrum maker. London, T. Read, Dogwell Court, Whitefriars, Fleet Street. 1739.

MILLER'S THUMB, another name for the freshwater fish called the bullhead (which see).

MILLET. The products of a number of cereal grasses bear this name in commerce. Italian millet (see Plate XC.-XCI. figure 4), a native of India, is the produce of *Setaria Italica;* it is employed in confectionary in this country. German millet, *Setaria Germanica*, is chiefly used for feeding cage-birds. *Andropogon Sorghum* yields the seed called Guinea-corn, durra, doora, joar, and Turkish millet. It is imported into this country for the purpose of feeding poultry. There is another millet, yielded by *Panicum miliaceum*, a native of the East Indies, where it is cultivated under the names of warree and kadi-kane.

MILLIARIUM AUREUM (milliary column), a gilt pillar erected by Augustus in the Forum, where the principal roads terminated. The miles were not actually reckoned from it, but from the gates of the city. The London stone in Cannon Street is supposed to have been a similar mark distinguishing the centre of the Roman roads in Britain.

MILLIN, Aubin Louis, professor of antiquities at Paris, member of the Academy of Inscriptions and of the Legion of Honour, and after the death of Barthélemy conservateur of the Paris Imperial Cabinet of Medals and Antiques. Millin was born in Paris in 1759, and at first devoted himself to the study of natural history, but afterwards to that of philology, and finally to archæology. In his earlier writings he appeared as a partisan of republican principles; among these are his Almanach Republicain, and other works, which he did not include in the later catalogues of his publications. In the reign of Napoleon he made two antiquarian excursions in France and Italy, where he discovered several remains which had been overlooked by the Italians. He was one of the most learned archæologists that France has produced. He edited the Magasin Encyclopédique from 1792 to 1816. Among his principal works are his Dictionnaire des Beaux Arts; Monumens Antiques inédits; Galérie Mythologique; Peinture des Vases Antiques; Voyage dans les Départements du Midi de la France; Histoire Métallique de la Revolution Française; Histoire Métallique de l'Empereur Napoléon. His lectures, which were fashionably attended, contributed, with his works, to diffuse a taste for the study of antiquities in France. His services as a conservateur of the Cabinet of Antiques, of which he made a systematic arrangement, also deserve to be remembered. He died in 1818.

MILMAN, Henry Hart, D.D., Dean of St. Paul's Cathedral, poet and historian, was the youngest son of Sir Francis Milman, physician to George III. He was born in London, 10th February, 1791. He was educated at Dr. Burney's Academy, Greenwich, at Eton and at Brasenose College, Oxford. He took the degree of B.A. in 1813, was a Fellow in 1815, and M.A. in 1816. In 1812 he received the Newdegate prize for an English poem on the Apollo Belvidere. In 1815 he published Fazio, a tragedy, which was performed at Covent Garden Theatre without his consent. In 1817 he was appointed vicar of St. Mary's, Reading. In 1818 he published a heroic poem called Samor, Lord of the Bright City, founded on legendary British history. In 1821 he published

the Fall of Jerusalem, which established his reputation as a poet. He was appointed professor of poetry at the University of Oxford in 1821, and held the appointment till 1831. During the former year he published three dramatic poems, The Martyr of Antioch, Belshazzar, and Anne Boleyn. In 1827 he was appointed Bampton lecturer, and published a volume of sermons delivered on this occasion. In 1829 a History of the Jews from his pen was published anonymously in three vols. 18mo. In 1835 he was appointed rector of St. Margaret's, Westminster, and canon of Westminster. In 1840 a collection of his poetical works appeared, containing a poem, Nala and Damayanti, translated from the Sanskrit. In the same year he published the History of Christianity from the birth of Christ to the Abolition of Paganism in the Roman Empire, a work professedly written from a neutral stand-point in respect to theology. In 1849 he took the degree of D.D., and was appointed dean of St. Paul's, the same year he published a handsome edition of Horace, with a life, critical remarks, and illustrations from ancient art. In 1854 he published a History of Latin Christianity, including that of the Popes to the Pontificate of Nicholas V. (three vols. 8vo). To make this work complete he opens it with a sketch of the History of Christianity in Rome during the first four centuries. He also edited an edition of Gibbon's Decline and Fall of the Roman Empire. In 1856 he published a continuation of the above history to the Pontificate of Nicholas V. in six vols. 8vo, and some translations in verse, made at different periods, from Æschylus, Euripedes, and other Greek poets. His last work was the Annals of St. Paul's Cathedral, which he lived to complete, but not to see published. He died 24th September, 1868. Milman's earlier poems were overloaded with ornament. Of Samor D. M. Moir says—'For eloquence we have redundant fluency, and for inspiration, rhetoric.' In his Fall of Jerusalem his genius took a higher flight, and his early faults were to a great extent amended. It has been commended for 'a high, serene, antique glow of lyrical declamation;' and Bishop Heber, in the London Quarterly, thought it safe to promise it whatever immortality the English language could bestow. While his poetical genius is generally admitted, his style is censured as artificial. His historical works, while they brought upon him the charge of Rationalism, acquired him the reputation of being an able, diligent, and candid investigator, and a perspicuous writer of history.

MILNER, JOHN, a celebrated Catholic divine and writer on theology and ecclesiastical antiquities, was born in London in 1752, and finished his studies at Douay. In 1777 he was ordained a priest, and in 1779 appointed pastor to the Catholic chapel at Winchester. Dr. Milner's study of ancient ecclesiastical architecture procured for him admission into the Royal Society of Antiquaries in 1790. He contributed many valuable communications to the Archæologia, and published a Dissertation on the Modern Style of Altering Cathedrals, as exemplified in the Cathedral of Salisbury (1798). The same year he published his History, Civil and Ecclesiastical, and Survey of the Antiquities of Winchester (two vols. 4to), and in 1811 a Treatise on the Ecclesiastical Architecture of England during the Middle Ages (8vo). His Letters to a Prebendary were written in reply to a hostile tract by Dr. Sturges upon his Antiquities of Westminster. In 1801 he published his Case of Conscience Solved, or the Catholic Claims proved to be Compatible with the Coronation Oath. In 1803 he was appointed vicar-apostolic of the midland district. As the result of a visit to Ireland in 1807 and 1808 he published an Inquiry into certain Vulgar Opinions concerning the Catholic Inhabitants and the Antiquities of Ireland. At this period he was appointed agent in England to the Irish Catholic hierarchy. His solicitude for the interests of Catholicism in both countries induced him to take a journey to Rome in 1814, and he remained there about twelve months. In 1818 he published a treatise entitled the End of Religious Controversy, containing a defence of those articles of the Catholic faith usually regarded as objectionable by Protestants. This was succeeded by his Vindication of the End of Religious Controversy against the Exceptions of the Bishop of St. David's and the Rev. Richard Grier, and a Parting Word to Rev. R. Grier; with a Brief Notice of Dr. Samuel Parr's Posthumous Letter to Dr. Milner. His death took place in 1826.

MILO, an island in the Greek Archipelago, the ancient *Melos*. See MELOS.

MILO, a native of Crotona, in Italy, son of Diotimus, and one of the most celebrated Grecian athletes. He bore off the prize six times in the Olympic games. On his seventh attempt the agility of his opponent proved superior to the strength of Milo. He was appointed to command an army against the Sybarites, and at the battle at the Crathis, B.C. 511, his great strength is said to have given the victory to the Crotonians. Of his prodigious strength many anecdotes are related. When the temple in which Pythagoras was teaching his pupils was on the point of falling, Milo seized the main pillar, and delayed the destruction of the edifice until all present had escaped. He once carried a bull to the sacrifice on his shoulders, killed it with a blow of his fist, and afterwards, it is added, ate the whole of it on one day. His death is characteristically related. When enfeebled by age he attempted to rend open the trunk of a tree which had been split by woodcutters, but the wood closing on his hands, held him fast, and he was attacked and devoured by wolves.

MILREI, a Portuguese coin. The rei is the unit of account in Portugal, equal to $\frac{1}{2}\frac{1}{5}\frac{1}{0}$ths of 1*d*. A thousand reis is one milrei, equal to 4*s*. 4*d*. In enumeration the figure $ is used to denote the thousandth place, thus one milrei is written 1$000. The colon marks the place of contos (one million reis), the period the place of thousands of millions.

MILTIADES, son of Cimon, an Athenian general, who lived about B.C. 500. On the death of his brother Stesagoras, Miltiades was sent from Athens by Peisistratus to succeed him as tyrant of the Chersonesus. He imprisoned the chief men by stratagem, and established his authority by means of a force of mercenaries. He married Hegesipyla, the daughter of a Thracian prince. He joined Darius Hystaspes in his expedition against the Scythians about B.C. 503. The story of his having advised the Greeks to destroy the bridge over the Danube with which they were intrusted, and thus treacherously cut off the retreat of Darius, is probably unfounded. He subjected Lembros and Imbros to the dominion of Athens. Being alienated from Darius he fled from the Chersonesus on the approach of the Phœnician fleet. At Athens he was arraigned for tyranny, but acquitted. When Attica was threatened with invasion by the Persians he was elected one of the ten generals, and persuaded Callimachus to give the casting vote in favour of battle. When Miltiades' day of command came round he drew up the army on the field of Marathon, where, B.C. 490, he gained his memorable victory over the Persians. He afterwards persuaded the Greeks to intrust him with a fleet of seventy vessels, without demanding an account of his purpose, in order to follow up his success. With this, to gratify a private revenge, he attacked the island of Paros, but was repulsed, and dangerously

wounded. On his return to Athens he was impeached by Xanthippus for deceiving the people, and condemned to pay a fine of fifty talents as the cost of the equipment of the fleet. Being unable to pay he was thrown into prison, where he died of his wound. The fine was paid by his son Cimon.

MILTON, JOHN, an eminent English poet, was the son of John Milton, scrivener, London, and was born at his father's house in Bread Street, Dec. 9, 1608. His father was a musical composer of some ability, and specimens of his work are to be found in Burney's History of Music. He also wrote verses, which are said not to be good. Milton received his early education from Dr. Thomas Young, a Puritan divine of Essex, and afterwards in St. Paul's School, then under the presidency of Dr. Gill. On 12th February, 1625, he entered Christ's College, Cambridge, and was a resident at this university for seven years. He took the degree of B.A. in January, 1629, and of M.A. in July, 1632. At the university he was distinguished for the excellence of his Latin verses. In English composition he appears also at this time to have given unequivocal indications of future greatness. Among the works attributed to this period are, On the Death of a Fair Infant (1625 or 1626); part of a Vacation Exercise at College (1628); the Hymn on the Nativity (1629); On Shakspere (1630); on the University Career, and an Epitaph on the Marchioness of Winchester (1631). His parents had from early years intended him for the church; but this purpose, which he tells us he had himself adopted, was frustrated by his scruples in regard to subscription; perceiving that 'he who would take orders must subscribe slave,' he preferred 'a blameless silence before the sacred office of speaking bought and begun with servitude and forswearing.' His university course, he tells us, was free from all reproach, and approved of by all good men. On leaving college he repaired to his father's house, who, having retired from business, had taken a residence at Horton, in Buckinghamshire. Here he passed five years in a study of the best Greek and Roman authors, and, as is supposed, in the composition of some of his finest miscellaneous poems. His Arcades, Comus, L'Allegro, Il Penseroso, and Lycidas are commonly attributed to this period. He also drew out from his reading many sketches for dramas and other poems. He had at one time some thought of adopting the law as a profession, as his younger brother Christopher had done, but this was abandoned. That his learning and talents had attracted considerable attention is proved by the production of Comus at the solicitation of the Bridgewater family, which was performed at Ludlow Castle in 1634 by some of its youthful members; as also by his Arcades, part of an entertainment performed before the Countess-dowager of Derby, in the same manner, at Harefield. In 1637, on the death of his mother, he obtained leave of his father to make a continental tour; and having set out towards the close of the year he visited Paris, where he was introduced to Grotius, and thence proceeded successively to Florence, Rome, and Naples, in which latter capital he was kindly entertained by Manso, marquis of Villa, the patron of Tasso. His general reception in Italy was also highly complimentary, although he would not disguise his religious opinions. After remaining abroad for fifteen months he returned to England, giving up his intention of visiting Sicily and Greece, in consequence of accounts of the state of affairs in his own country. 'I esteemed it dishonourable,' he writes, 'for me to be lingering abroad, even for the improvement of my mind, while my fellow-citizens were contending for their liberty at home.' His Italian sonnets and some other pieces were written during this journey. He settled in the metropolis, and undertook the education of his two nephews, the sons of his sister, Mrs. Phillips. Other parents being also induced by his high character to apply to him, he engaged a house and garden in Aldersgate Street, and opened an academy for education. Milton's educational theories have been the subject of considerable controversy, on the merits of which it would be impossible here to enter. His mind was in many respects too lofty and his ideal too high for practical life, and Dr. Johnson observes that the education of England had been in danger of suffering injury from two of her greatest men, Milton and Locke; but this, it is evident, does not quite exhaust the subject. Milton had early acquired the full consciousness of his powers, and had already determined on dedicating them to a great poem which should be to the honour of his country; but in the midst of the political convulsions which agitated his country, and which soon broke out in civil war, he laid aside his individual project to mingle in the controversies of the day. His first pamphlet, Of Reformation touching Church Discipline in England, and the Causes that hitherto have Hindered it, was published in 1641. A list of the dates of publication of his principal works is appended to this notice. This treatise was a vehement attack on Prelacy. It was replied to by Bishop Hall, who was answered conjointly by five Puritan divines, and they again separately by Ussher and Hall, the latter under the title of the Remonstrants. These replies brought Milton again into the field. The mysterious name, Smectymnuus, which appears in this controversy, consists of the clubbed initials of the five Puritans.

In 1643 Milton married Mary, the eldest daughter of Richard Powell, justice of the peace, of Forest Hill, near Shotover, Oxfordshire, an ardent royalist. His marriage proved somewhat unfortunate. His wife, accustomed to the hospitality of her father's house, found Milton's ways austere and his household intolerably dull. She took occasion to go back on a visit to her father's house, and on repeated application positively refused to return to her husband. This led to a new series of publications. On the plea of defending private liberty Milton wrote in quick succession four treatises advocating divorce. These tracts are based on the strong view of the superiority of the male sex, amounting almost to a contempt for women, which Milton even in his poetry is but indifferently able to conceal. It is curious, in this connection, that his choice of subjects both in Paradise Lost and Samson Agonistes were well calculated to shelter depreciatory views of the female character; while Comus, which contains an exalted ideal of it, was written before marriage. Milton even proceeded to follow out his views by paying attentions to a Miss Davis, and it is thought by most of his biographers, with serious intent. It has, however, been rather skilfully suggested that he had merely adopted the somewhat female stratagem of trying to win his wife back by craft. If so, he succeeded. The ill-fortune of the royalist cause, and perhaps the formidable character of their son-in-law, contributed to dispose her parents to a reconciliation; and after a due expression of penitence on her part, and the taking of a larger house on his, she was, towards the end of 1645, generously forgiven and received back. During the time of this separation Milton wrote his tract On Education, and his greatest prose work, the Areopagitica, and the first collected edition of his poems appeared soon after. Milton's own father and his wife's family, who had been driven from Oxford by the success of the parliamentary army, were now domiciled with him, and his literary labours appear in consequence to have suffered some relaxation. The death of his father and father-in-law, and the return of his wife's

family to Oxfordshire, reduced his household again to its natural limits; and in 1647 he removed to a smaller house in Holborn, and gave up teaching. He now began to write his History of England. Having written a tract in defence of the trial and execution of Charles I., he recommended himself by so serviceable a performance to the government, by whom he was offered the post, which he accepted, of Latin secretary to the council. The duties of the office were to conduct correspondence with foreign powers in Latin. The salary was about £290 a year. His appointment dates from 15th March, 1649. As the agent of the council Milton wrote his Eikonoklastes (image-breaker) in answer to Gauden's Eikon Basilikē (royal image). (See EIKON BASILIKE.) He was also commissioned to answer a Latin work in defence of King Charles, which was circulating with great effect on the Continent, from the pen of Salmasius (Claude de Saumaise), 'the prince of scholars.' The controversy thus opened soon included other writers, and raged with great bitterness notwithstanding the death of Salmasius (1653), which Milton got credit for occasioning by the bitterness of his invective. Salmasius was reduced from the defence of the king to the defence of his own Latinity. About 1644 Milton's sight had begun gradually to fail; about 1650 he began to be threatened with total blindness, and in 1653 he was totally blind. The affection was *gutta serena*, or amaurosis, which left his eyes without external disfigurement. About this time also he lost his wife, who left him three daughters. Notwithstanding his blindness he continued to act as Latin secretary during the protectorates of Oliver and Richard Cromwell. Andrew Marvell was latterly associated with him in the office. He still continued to write Latin pamphlets against the adversaries his reply to Salmasius had stirred up against him, and in these he eulogized Cromwell and the protectorate. In November, 1656, he married his second wife by civil contract. She died in childbirth in February, 1658. This occasioned the well-known sonnet beginning,

'Methought I saw my late espoused saint.'

In the interval between the death of Cromwell and the Restoration Milton strove, as far as the influence of his pen extended, to prevent the consummation to which the minds of his countrymen were evidently turning, as a reference to his tracts during this period will show. The Restoration put an end to the political career of Milton. Some of his writings were called in and burned, but personally, although for a brief period he was actually in custody, he escaped unmolested, and was not excluded from the Act of Indemnity. He is said to have owed his immunity to the royalist poet Davenant, whom he had befriended during the triumph of republicanism. During the whole of this agitated period Milton's muse had been all but silent. His prose writings produced during this period indicate both the great grasp, and for a keen partisan as he was, the extreme liberality of his mind. His theories may often be impracticable; but this is usually because they attempt to reach an ideal above the level of human nature. In church matters his advocacy of toleration was of the broadest kind, and he can hardly be said to have identified himself thoroughly with any of the sects of his day. He did not disdain to use the common weapons of the controversialist, and he wielded every species of the rhetoric of invective with all the strength of his nature. Milton was not only an eminent scholar, but scholarship was in a very special manner congenial to his tastes and habits. It is very remarkable to find a man of so much original genius develop a taste for mere compilation, yet Milton, of his own voluntary choice, worked laboriously as a compiler. His scholarship has perhaps, on the whole, exercised a somewhat adverse influence on his poetry. The multitude of his classical allusions limits the full appreciation of it to a comparatively small number of readers, and these perhaps not altogether of the class to whom poetry is for its own sake the most congenial study. But this is not all. There is not wanting an element of obtrusiveness in his learning, which has occasionally all the inconveniences of pedantry. For example, it is easy to understand how different poets may give different genealogies of their mythical beings, and how scholars may collect these; but as in poetry a mythical being is a real one, to cite authorities and give a scholarly account of varied genealogies seems inevitably to dispel the illusion, and evaporate the spirit of poetry in which the myth is enshrouded. Yet Milton in his L'Allegro, in a very graceful passage in which he introduces Euphrosyne, between the naming of the goddess and the invocation 'Haste thee, nymph,' introduces two rival genealogies of her, the first affirmatively, the second with the gloss preceding it of 'or as some sager sing.'

Milton still continued to live generally in London. About 1663 or 1664 he married his third wife, Elizabeth Minshull. He continued various prose works which he had begun during the interregnum, as his History of England, and began others which will be found in the annexed list. Among the other labours of this period of his life he proceeded a considerable way with the compilation of a Latin dictionary. Besides his daughters, who detested the task, he had many volunteer readers and amanuenses. Paradise Lost was probably completed in 1666. It was sold on 27th April, 1667, to Samuel Simmons for £5 down, and £5 for each successive edition of 1500 copies, to be paid when 1300 were sold. It was probably begun about 1658, and it seems to have been first projected in the form of a mystery, or sacred drama. It was originally published in ten books, the second and seventh being afterwards divided. The first edition was sold in two years; the third was published in 1678, and in 1681 Milton's widow sold her interest in the work to Simmons for £8. Paradise Regained was published along with Samson Agonistes in 1671. Ellwood, one of Milton's amanuenses, attributes the Paradise Regained to his own suggestion. In 1673 a second edition of Milton's collected poems appeared. An important work of Milton's, written in his later years, De Doctrina Christiana, was discovered in 1823, and excited some interest on two grounds. To the general public it was a surprise to learn that the orthodoxy of Milton was less unassailable than it had been imagined to be; and that in particular on the important dogma of the Trinity he held a view essentially Arian, namely, that the Son of God was a creature, and the maker of all things in heaven and earth by delegated power. To scholars it possessed an additional interest as throwing some new light upon the mind of Milton. Southey says of this work, 'All the world knew that he (Milton) was an eloquent, a high-minded, an austere man, mighty in the Scriptures; but how visionary he was (though Warburton threw out hints that could not have been altogether neglected by able inquirers) none of his biographers have ever told us; not indeed, perhaps, until the treatise on Christian Doctrine was brought to light could they tell us at full; yet here, and here alone, will be found the solution of many anomalies in his history, and many peculiarities in his poems.'

Milton's poetical works have been the theme of every English critic. It is almost invidious to mention names, as every writer who has dealt extensively with our literature must have noticed the foremost

poems in our language. Without professing to be exhaustive we may, however, mention among Miltonian critics Addison, Johnson, Hurd, Warton, Blair, Channing, Coleridge, Hallam, and Macaulay. Of foreign critics, Châteaubriand, Schlegel, and Paoli Rolli may be mentioned. Upon a subject which has been so exhaustively treated it would be superfluous here to enter; but we may hazard a single observation, which is suggested by Milton himself, upon his great epic. In the Areopagitica Milton says, 'When God gave him (Adam) reason he gave him freedom to choose, for reason is but choosing.' In the Paradise Lost the prominence given to divine pre-ordination and supervision so overshadows the actions of the created intelligences, that anything like a spontaneous initiative, or even adequate purpose in them, is almost completely lost. The angels, in particular, move about in a superfluous guardianship, and are constantly being commissioned by God himself to perform offices the end of which has been otherwise provided for. These hollow ministrations in fact constitute nearly the whole staple of their appearance in the Paradise Lost. The war between the angels and the devils, with its half ludicrous incidents, much as it has been eulogized by critics, is perhaps the most prominent instance of this want of genuine action; and the defect is more clearly shown here from the pointed contrast between this unreal war and the calm and terrible sublimity of the succeeding passage, in which the true action of the poem is restored, and the Messiah forces his terrified foes to precipitate themselves from the battlements of heaven. This falsity in the action of the poem has two effects contrary to its intent. It makes its interest centre to a far greater extent than is legitimate, upon the devils, who, being in rebellion to the constituted authorities, retain more of the appearance of independence; and it defeats the professed design of the poem, 'to justify the ways of God to men,' that is, to reconcile the divine disposing of events with human freedom and responsibility. This design manifestly fails in action; and it cannot be accomplished, poetically at least, by any amount of sermonizing.

Milton's death, which is said to have been caused by gout, took place on Sunday, 8th November, 1674. His remains were interred in the church of Cripplegate, where the elder Samuel Whitbread erected a monument to his memory. In 1737 one was erected in Westminster Abbey. Milton was distinguished in his youth for personal beauty; his habits of life were those of a student and philosopher, being strictly sober and temperate; his chief relaxations consisted of music and conversation. His temper was serene and cheerful; and although warm and acrimonious in controversy, he appears to have indulged no private enmities, and to have been civil and urbane in the ordinary intercourse of society.

Among the biographies of Milton are J. H. Todd's Account of the Life and Writings of Milton, with a verbal index to the whole of his poetry (1809); An Account of the Life, Opinions, and Writings of John Milton, with an Introduction to Paradise Lost, by T. Keightley (1855); Professor David Masson's Life, narrated in connection with the Political, Ecclesiastical, and Literary History of his Time (vols. i.–vi. 1859–1880). Masson's Life is the most important contribution to Miltonic literature of the present day. The prose works of Milton, including a translation of the treatise on Christian Doctrine, have been published in Bohn's Standard Library (5 vols. 1848–1853).

The following are the original dates of publication of Milton's principal works:—English prose—In 1641: Of Reformation touching Church Discipline in England, &c.; Of Prelatical Episcopacy; The Reason of Church Government urged against Prelaty; Animadversions upon the Remonstrants' Defence against Smectymnuus. 1642: An Apology for Smectymnuus; Observations upon some of His Majestie's late Answers and Expresses, and Reply to the Answer (that is, the answer printed by his majesty's command); An Argument concerning the Militia; Tyrannical Government Anatomized. 1643: The Doctrine and Discipline of Divorce. 1644: The Judgment of Martin Bucer concerning Divorce, Englished; Letter to Master Hartlib on Education; Areopagitica. 1645: Tetrachordon; Colasterion. 1647: A Treatise of Magistracy. 1649: The Tenure of Kings and Magistrates; Eikonoklastes. 1659: A Treatise of Civil Power in Ecclesiastical Causes; Considerations touching the likeliest Means to Remove Hirelings out of the Church; A Letter to a Friend Concerning the Ruptures of the Commonwealth. 1660: The present Means and brief Delineation of a free Commonwealth, easy to be put in practice and without delay, in a Letter to General Monk; The Ready and Easy Way to Establish a free Commonwealth. 1669: Accedence Commenc't Grammar. 1670: The History of Britain, that part especially now called England, from the first Traditional Beginning to the Norman Conquest (mutilated by licenser, excised passages published 1681). 1673: Of True Religion, Heresie, Schism, Toleration. 1681: Character of Long Parliament and Assembly of Divines. 1682: A brief History of Muscovia. Latin prose works:—In 1650: Pro Populo Anglicano Defensio contra Salmasii Defensionem Regiam; 1655, Defensio pro se; 1654, Defensio secunda pro Populo Anglicano; 1670, Artis Logicæ Institutio; 1825, De Doctrina Christiana. Poems—Sonnet to Shakspere (first printed of Milton's works), anonymously among laudatory verses prefixed to the second folio Shakspere in 1634; Comus, 1637; Lycidas, 1638; Minor Poems collected, 1645; Poemata Latina, 1645; Paradise Lost, 1667; Paradise Regained and Samson Agonistes, 1671.

MILWAUKEE, a town in the United States, chief city of the state Wisconsin, on the west shore of Lake Michigan, which here receives the united rivers Milwaukee and Menomonee, the former stream being navigable to the heart of the city. Part of the town occupies a high bluff overlooking the lake, and the whole place is well and regularly laid out, with houses of cream-coloured brick, and enjoys a remarkably pure atmosphere and a salubrious climate. Among the chief buildings of the city are the courthouse, post-office, and two cathedrals. There are numerous railways that centre here. The main element in the prosperity of Milwaukee is its vast trade in grain. It has also numerous and extensive industrial establishments connected with iron, flour, leather, lager-beer, agricultural implements, &c. The city is supplied with water from Lake Michigan. It has rapidly advanced from a population in 1840 of 1700 to one in 1880 of 115,587. It has a large German population.

MIMES (Gr. *mimos*, a mime), a kind of dramatic performance common among the ancient Greeks and Romans. The mimes appear to have sprung up among the Greek colonists of Southern Italy. The mimes among the Greeks consisted first of extemporary representations at festivals of ludicrous incidents of common life. They were afterwards more artistically developed, and Sophron of Syracuse (B.C. 460–420) wrote pieces for them in rhythmical Dorian prose in the Doric dialect. The word mimus was applied by the Romans both to a species of comedy in which mimicry predominated, and to the actors in it. The representations were of the kind of actions usual in comedy or burlesque, and were frequently indecent. The mimes appear to have been originally represented at funerals, and the life of the deceased

was caricatured by the actors. They were subsequently performed on the stage, and under the empire replaced the more refined Atellanæ. See ATELLANÆ FABULÆ.

MIMICRY, the name applied of recent years to certain phenomena observed in the animal and plant worlds, whereby an animal or plant assumes a close resemblance in outward appearance to another organism generally of entirely different nature, or even to some inorganic object. The Leaf-insects (which see) thus mimic in closest detail the appearance of leaves. The 'Walking-stick Insects' (Phasmidæ) imitate in their outward conformation the exact appearance of dried twigs, and even in their mode of walking reproduce strange awkward movements, comparable to the movements of twigs blown about by the wind. Certain tropical butterflies reproduce the appearance of leaves so closely that even the parasitic fungi which grow upon the leaves are mimicked and reproduced in the coloration of these insects. Some South American butterflies again imitate the appearance of certain other species (Heliconidæ) of butterflies which emit a very offensive odour. The former species possess no odour, and thus assume the appearance of the Heliconidæ for the purpose of protection—the birds which are prevented by the odour from attacking the Heliconidæ, being deceived by the similar appearance of the mimicking and inodorous butterflies. Similarly a South American moth and a humming-bird most accurately reproduce the external features of each other. And minor or less striking examples of mimetic phenomena may be found throughout the animal world in the general likeness of colour between many animals and their habitations. Thus many insects living in or upon the ground are so coloured that their movements are difficult to detect; and even among the Mammalia, the colour of the hair or fur will in many cases be found to closely resemble that of the ground or objects amongst which the creatures reside. From the plant world many similar and equally striking examples of mimicry are to be obtained. Thus a general resemblance is to be perceived between the submerged leaves of aquatic plants which may differ greatly in the place or rank they occupy in the vegetable series. The leaves of Ranunculus and Myriophyllum, or of Chara and Potamogeton, thus exhibit a sameness of leaf-type. The resemblance between the Cacti of tropical America and the Euphorbias of Africa has long been a subject of note among botanists, yet these two groups are as far removed structurally from one another as two orders of plants can be. And it is further found that these resemblances are not wholly of a general kind, for certain types of Cacti imitate closely certain types of Euphorbias; and in these particular instances the mimetic resemblance becomes of a more striking and particular kind. The *Rhipsalis funalis*, a Cactus from South America, thus imitates most closely the *Euphorbia Tirucalli* of Southern Africa. Regarding the causes or reasons of mimicry biological science is greatly divided in opinion; and theories upon this subject, and indeed the entire subject itself, have chiefly been promulgated in consequence of the evolutionary views regarding the origin of living beings, which have of late years been so largely discussed. Thus one explanation of the mimetic resemblances is given under the theory of natural selection, this view according with the opinions of Messrs. Darwin, Wallace, and Bates. These authors maintain that the resemblances are induced by slow gradations: each gradation or variation towards the mimicked object being perpetuated in the mimicking species to the disadvantage or death of the non-mimicking members, and to the propagation and survival of those which do mimic—the 'fittest' who survive being those which most strongly develop the mimetic phenomena. A second theory, that of *hybridization*, has been enunciated by Mr. Andrew Murray. This latter theorist maintains that interbreeding has much to do with these resemblances; but this view has not met with very cordial support, from its obvious inapplication to all the cases of mimicry—as those where inorganic objects are mimicked, or where animals mimic plants—and from other and as great difficulties which at once suggest themselves on a consideration of the matter. What has been termed *homomorphism*—that is, the resemblance between *groups* of animals or plants widely removed from each other in structure—becomes related in a manner to that resemblance of limited groups or species which we term mimicry. And the consideration of the present subject necessarily includes that of the latter also. Explanations of both phenomena thus assert that exposure to the influences of like conditions or external agencies will produce similar or allied results in organisms; whilst added to this we have the idea of a common anterior *origin*, serving to further elucidate the probable causes of these resemblances. The older idea advocated the idea of special creations in special centres; and in this view each of the forms allied in appearance was believed to have been simply created, each in its own habitat, and a similarity of surroundings might then and ultimately operate to produce the resemblances. It is needless to remark that all of the foregoing suggestions are mere hypotheses, and nothing more; and without expressing opinions as to the merits of any, we may conclude that 'mimetism,' or 'protective resemblance,' as it has been termed, generally tends to protect those organisms which mimic a species already occupying a safe position as regards its natural enemies. To assert that more than a mere *resemblance* has been proved, or that actual relationship may be traced, is to unwarrantably anticipate the scientific researches of the future.

MIMNERMUS, the name of an ancient Greek poet and musician. He is usually called a Colophonian, but was probably born at Smyrna, and flourished from about 630 to 586 B.C. Two manuscript books of his poems were burned by the Byzantine monks, and only a few fragments belonging to a poem called Nanno, addressed to a flute-player of that name who was the object of his passion, have come down to us. They form an epoch in the history of elegiac poetry, having first diverted it from warlike and convivial to plaintive, amatory, and mournful strains.

MIMOSA. See SENSITIVE PLANT.

MIMOSEÆ, a family of plants of the natural order Leguminosæ. It contains the apetalous genera, furnished with a calyciform involucre, stamens very numerous and free. It contains numerous species, mostly natives of tropical climates; among the genera are *Mimosa*, *Acacia*, and *Inga*. Astringency in the bark and the production of gum are among the leading characteristics of the tribe.

MIMULUS, a genus of plants of the natural order Scrophulariaceæ (Figworts), with a bell-shaped bilabiate corolla. The calyx is divided into five parts. The stigma is bilamellate; the lamellæ are irritable and close on irritation. This movement is supposed to subserve purposes connected with fertilization. The *Mimulus luteus*, a native of Peru, &c., has become naturalized in Great Britain, and *Mimulus moschatus* is cultivated for its musk-like odour.

MINA (*mna*), among the Greeks, a weight of 100 drachmæ; also a piece of money valued at 100 drachmæ; sixty of them were equivalent to a talent.

The Attic mina was £4, 1*s.* 3*d.*, and the talent £243, 15*s.*; the Æginetan mina was £5, 14*s.* 7*d.*, and the talent was £343, 15*s.*

MINA BIRD. See GRAKLE.

MINARET (Arabic, *minarat*, a lantern), a lofty turret, generally surrounded with balconies, and erected in connection with the mosques in Mohammedan countries, from which the *muezzin* summons the people to prayer and announces the hours, bells not being used by the Moslems. The minaret is terminated with a spire surmounted by the crescent. See MOSQUE.

MINAS GERAES, the most populous province of Brazil, bounded N. by Bahia, E. by Bahia and Espirito Santo, S. by Rio de Janeiro and São Paulo, S.W. by São Paulo, and W. by Goyaz; area, estimated at 246,700 square miles. The surface is mostly mountainous, and though lying within the tropics its elevation renders the climate temperate and healthy; but the low tracts are periodically flooded, and contain extensive swamps and pools. It is rich in minerals, gold, silver, platina, copper, lead, diamonds, rubies, and other precious stones being found. Extensive iron-works have been erected in the neighbourhood of Ouro-Preto. Sugar-cane, cotton, millet, tobacco, and coffee are cultivated. The cultivation of cereals is extensive, and the finest European fruits have been introduced. Vast herds of cattle and swine feed in the pastures and forests. Timber and dye-woods of the most valuable kind, together with numerous varieties of gums, balsams, and medicinal plants, grow freely in the latter. Some trade in home manufactures, and an extensive foreign commerce, have been established. For administrative purposes Minas Geraes is divided into fourteen comarcas. It sends twenty members to the General Assembly, and ten to the Senate. The provincial assembly is composed of thirty-six members. It sits in Ouro-Preto. Pop. (estimate 1882), 2,168,000, including 279,527 slaves.

MINCH, THE, the channel off the north-west of Scotland, between the mainland and the island of Lewis; it is above 30 miles wide, and on either side are numerous lochs or sea-arms penetrating inland. ——The LITTLE MINCH is the channel between the island of Skye and Long Island; its narrowest part is about 15 miles wide.

MINCIO (*Mincius*), a considerable river of Italy, which flows from the south extremity of Lake Garda, and after forming the lake and marshes that surround Mantua falls into the Po 8 miles below the city. Its banks are remarkably fertile, and celebrated for their beauty by Virgil, who was a native of this country. It formed an important base of operations in the wars between France and Austria. The length of its course is 42 miles.

MIND, HUMAN. The human mind is the central point around which the controversies of philosophy range. For the form assumed by these controversies see the articles METAPHYSICS and PSYCHOLOGY. The human mind may be considered either as a whole or as comprehending various powers, active or passive, faculties or capacities, which may be specially observed and described. This susceptibility of division indicates the greatness of the subject. A preliminary difficulty also attends the inquirer at its threshold. It cannot be defined or illustrated by reference to other subjects. Mind is unlike anything else. If we are to know anything about it it must be by direct observation. This indicates the method of inquiry suitable to the subject; and it is to the neglect of this method that most of the confusion and contradiction, as well as some of the obscurity which surrounds it, is to be ascribed. This method is that properly called the psychological; for its establishment or restoration modern philosophy is indebted to Descartes. According to this method the proper starting-point of philosophy is the mind itself in the present exercise of its powers. It is opposed to the historical method, which begins by attempting to trace the history of mind, to discover its genesis, and to ascertain its relations to other things. According to the Cartesian theory this investigation, highly important and useful in its own place, is impracticable until we have first determined something in relation to the mind, the investigating agent itself, and according to the result of this preliminary determination will be the whole value of the subsequent investigation. The mind, to begin with, is something, or there would be no investigation; and the first question is, What is it? and not, How did it originate? It is not indeed necessary that we should ascertain exhaustively what the mind is before we can proceed by a historical inquiry to ascertain whence and how it came to be such, for then all further inquiry would be hopeless; but some things must be ascertained, as, How does the mind receive and judge of evidence? What is the value of its powers of observation, and of its appreciation of what it observes? In short, Have we in the mind the conditions of historical investigation? Our first excursions in philosophy must be to try and test the powers or resources of the mind itself; to ascertain, as far as may be, their extent and relations; and to discriminate them, if possible, from other things with which they come in contact, mind from not-mind. To some extent this inquiry must precede history, and it is only in as far as this inquiry has given us distinct views that we can draw anything certain from our historical investigations. If we are incapable of discriminating what we already know we can have little hope of bestowing a better judgment upon new facts. This investigation is properly the work of psychology, and its method is to begin with the investigation of the mind in the concrete, with its present powers in their actual development. It is violated by Locke when he appeals in disputed points in psychology to the supposed genesis of our powers in infancy; and it is violated by modern evolutionists when they import into psychology a supposed genesis of our race and a cyclical history of the development of our mental powers. It must also be added that while Descartes has rendered an inestimable service to philosophy in giving it this method, it is very badly exemplified in his own practice.

The Cartesian method, beginning with the investigation of the powers and relations of the mind, leads directly to the questions involved in the mental phenomena called moral. Is the mind active or passive? Are its actions necessarily determined by antecedents; or has it an inherent power of determining, as an original cause, its own actions? These questions lie at the root of moral philosophy; for if the mind has no inherent power of determining; if choice is only a necessary inclination towards the stronger motive, moral philosophy can amount to nothing more than a descriptive science. If, on the other hand, there is in a given state of the mind a power of self-determining choice between varying antecedents, according as these antecedents or the actions they prompt to are better or worse, the mind which chooses them will be better or worse. But what we have to observe is that this question can be determined only psychologically; that is to say, it is a question of fact, and can only be determined by observation. If we cannot decide it by observing what passes in our own minds there is no other way in which for us it can be decided. The attempt, indeed, is often made to reach the decision by a shorter road. It is supposed that any power of ori-

gination in the mind can be shut out by an exhaustive syllogism; but as this syllogism must include not only the state of consciousness of the mind but its passions, it necessarily includes the psychological difficulty. Are these passions necessarily raised in proportion to the objects presented to them; or are they to any extent under the control of the mind itself? The power of attention also demands consideration. There are always present in the mind numerous objects of consciousness; but there is in the state of consciousness a synthesis, produced by the mind's directing its attention specially to some one object or to certain portions or attributes of the objects before it. Is this attention necessarily determined or not? For if we assumed that the mind could not control its passions when it suffered itself to dwell on their appropriate objects, yet if it had the power of concentrating its attention on or withdrawing it from these objects an indefinite power of originating and controlling action would still belong to it.

The questions connected with the relations of mind to not-mind, of subject and object, of the surroundings and relations of mind to other similar or different forms or manifestations of being, are likewise psychological questions. These questions, by the extraordinary number and divergency of the answers they have received, are the despair of philosophy. These answers range from the assumption that all external or objective phenomena are but subjective manifestations or modes of mind, to the opposite one, that mind itself is but the product of a pre-existing external organism. It may, perhaps, be safely affirmed that neither of the extremes in these conclusions can be reached without a violation of the psychological method. According to Descartes the fundamental and essential attribute of mind is thinking. This will generally be accepted by psychologists as a sound generalization or true deduction from observation. It is to be observed, however, that thinking is not mind itself, but a product of mind. We cannot conceive of thought as existing of itself, but only as existing in a being who thinks. But if we accept thinking as the essential attribute of mind, we have an elementary definition of mind, and are able to distinguish it from other things which have not this attribute. Whatever thinks is mind; whatever does not think is not mind. We are conscious from observation of many things which do not manifest the attribute of thinking, and to these things we give the distinctive name of matter. But material things have also their attributes which are capable of being observed and recorded. We have thus as distinguishable forms of being, mind and its attributes and matter and its attributes. If it is alleged by the idealist that the whole of this distinction is purely subjective, the answer is that the objection is simply a question of the truth of consciousness, without reliance upon which neither he nor we can proceed one step in philosophical investigation. The subjective condition of our knowledge, which seems to the idealist to invalidate our belief in the existence of external things, is not a condition of our knowledge merely, but of all possible knowledge; for how can any intelligence know but through his own consciousness? If the intrusion of our consciousness therefore invalidates our knowledge of external things, all possible knowledge of anything outside himself is for ever excluded from any intelligence. Ferrier, who calls himself a real-idealist, makes the curious mistake of confounding what is inseparable in knowledge from what is inseparable in existence. When I look at a tree the object of my knowledge, according to him, is myself-seeing-a-tree. This is the absolute, and exists; but I am the relative, and do not exist, and the tree is the relative, and does not exist, except in synthesis with its correlative. The mind, the thinking person, besides the consciousness of himself and of his own thoughts, is conscious of things without him which are neither himself nor his thoughts, but only the instruments or occasions of them. Is this denied? Then the whole of consciousness is but a wild confusion of conflicting elements, and no subjective philosopher has ever yet succeeded in reducing his thoughts into obedience to his own theory. Ferrier makes a remarkable confession to this effect in the introduction to his Institutes of Metaphysic. After telling us that the object of his science is to correct the inadvertence of ordinary thinking, he proceeds in section 64 to answer the objection that its conclusions cannot during ninety-nine parts (out of a hundred) of a man's existence be present to his conviction with the force and vivacity which he might think desirable if they were true. 'But this,' he says, 'is neither desirable nor necessary. Their perpetual presence would convert him from an agreeable human being into a nuisance both to himself and others. It is the worst species of pedantry to entertain and parade the conclusions of science, either to ourselves or others, when engaged in the common business and intercourse of life; just as it is the worst species of prudence to embrace the plausibilities of common opinion, the maxims of the *salons* and thoroughfares, when ministering at the altars of science. The two things should be kept everlastingly apart. All that is necessary is that the reader should *know* that what is laid before him is the truth; it is not necessary that he should feel it to be so.'

Contrast this with Milton:—

> 'How charming is divine philosophy!
> Not harsh and crabbed, as dull fools suppose;
> But musical as is Apollo's lute,
> And a perpetual feast of nectared sweets,
> Where no crude surfeit reigns.'

So far psychology is justified in going, but the Cartesians have gone much further, and by their ultroneous conclusions have landed themselves in inextricable difficulties. They have, for example, drawn an absolute line of distinction between mind and matter, and asserted a complete independence in the former of the latter. In virtue of this view the Cartesians in France have styled themselves spiritualists. But this is pushing the distinction between mind and matter beyond what psychology warrants. We know certainly an attribute of mind which does not exist, or at least which is not manifested to us in matter; but we know of the existence of mind only in relation to matter, and before we can assert its possible existence out of relation to it we must know at least one of them exhaustively. If we knew mind exhaustively we might be able to say that it was independent of matter, or if we knew matter exhaustively we might be able to say it was unnecessary to mind; but the proof that we do not know either exhaustively is that we do not know their relation to one another. The facts of that relation actually known have, indeed, a great weight, and enable us to assign the superiority to mind and the position of instrumentality to matter; but they do not enable us to conceive, otherwise than as an abstracted conception, of a state of intelligent existence out of relation to instrumentality, nor to determine whether such a mode of existence is possible for us. Whatever views we may have on such subjects as matters of speculation or of faith, we do not seem at present capable of knowing anything on them from psychology. Psychology, however, leads us to the consideration of another relation of mind than that to matter, a relation suggested by its manifested supe-

riority to matter on the one hand, by its own attributes and its finite and dependent condition on the other; and which, by suggesting a first cause, who as the author of intelligent beings must necessarily be intelligent, excludes the possibility of regarding mind as a mere product of organization.

Descartes distinguishes matter by the essential attribute of extension. Whether this is really the distinguishing quality of matter may, perhaps, be held doubtful; but the distinction has been carried out by others in a way about which there can be no doubt. The distinction between mind and not-mind has been represented by calling it a distinction between the extended and the unextended. Whatever may be the case with matter it is certain that mind is not distinguished by the epithet unextended. In any sense in which the term is applicable to mind it is applicable also not only to the attributes of mind but to the attributes of matter. Motion is not extended any more than thought. Another distinction made between mind and not-mind is to call the former the universal, the latter the particular in cognition.

The theory of the relations of mind and matter have given occasion, especially among the Cartesians, to many curious speculations. Three leading explanations have been given of it. The theory of occasional causes advocated by Malebranche and other Cartesians, affirms that there is no real causal connection between the reciprocal actions of mind and body, but only modifications produced on the one on the occasion of what happens in the other; the theory of pre-established harmony adopted by Leibnitz supposes that the two natures have been so co-ordinated at their creation that the actions produced by the evolution of their internal forces must always correspond; the theory of the plastic medium upheld by Cudworth represents the existence of a medium partaking of the nature both of mind and body, through which the communication between them is maintained. Pascal takes a juster view of this subject. 'Man,' he says, 'is to himself the greatest prodigy of nature. He cannot conceive what a body is, still less what a spirit is, and least of all how a body can be united to a spirit; and yet that is his own nature.' From the attention bestowed on the question both by physiologists and philosophers, as well, perhaps, as from the nature of the case, it may probably be concluded that to discover the true nature of the connection between body and soul, mind and matter, lies beyond our capacity; but the element of contradiction, which in philosophical reasoning has so frequently been associated with this connection, would seem to be entirely due to the readiness of philosophers, both spiritualist and materialist, to assume more than they actually know as to the properties of one or the other. That there can be no real contradiction is evident from the fact that the connection exists; but while the spiritualists have defined matter and mind respectively as destitute of all common or communicable properties, the materialists, by deriving mind from matter, the conscious from the unconscious, have degraded the necessary laws of consciousness into a mere product of a particular organism. If, however, we suppose, as there seems good reason to do, that matter is neither a self-subsistent product of some remote effort of creative power nor the primeval form of being, but a present creation, the constant emanation of divine power, the instrument of communication between the Creator and his sentient and intelligent creatures, and the means by which he assigns them their place in the scale of being, and imposes on them a portion at least of the laws by which they are governed, the secret of the connection between mind and matter, may indeed remain unrevealed, but the very fact of its impenetrability will remove the possibility of imagining any reasonable ground for suspecting it of any element of contradiction.

Another much agitated question is as to the origin of the soul in connection with the human body. Various answers have been given to this question by spiritualists. Pythagoras, Plato, and others believed in the pre-existence of the soul. Tertullian, Luther, and Leibnitz held that all human souls existed in germ in our first parent, and have been transmitted by generation. The most common opinion is that each soul is created by God at the moment of its junction with the body. Another question much agitated relates to the extent of the functions of the soul. The great majority of philosophers attribute to its origination all the vital functions of the body. Another class, however, among whom is Maine de Biran, limit it to the voluntary and intelligent actions; and some of this class give man both an animal soul, like the beasts, and a mind, spirit, or intelligent soul. Another question which has caused great perplexity is the extent of the resemblance between human and brute intelligence. It is clear that observation supplies no absolute distinction between human and brute intelligence except one of degree. We have at least not been able to discover any faculty or attribute of human intelligence of which some germ may not be discovered at least among the higher animals. But the consequences of this analogy appeared so formidable to Descartes that he abandoned the method of observation and took to that of hypothesis in order to demolish it. According to him the lower animals were pure automata, or organized machines. This hypothesis, which is actually introduced in his Discourse on Method, though not directly connected with psychology, is as great a deviation from his own method, of receiving nothing as truth but what is clearly demonstrated to be such, as could well be practised.

The question of the immortality of the soul is usually associated with the question of its origin, material or immaterial, but it is more properly associated with theism or atheism. He who believes that the Author of our being is an infinite intelligence may reasonably assume the permanence of his work; but he who attributes it to a blind chance has no criterion to guide him in estimating future possibilities.

The division of the powers of the mind into particular faculties may be considered as partly natural and partly arbitrary. Every philosopher adopts, to some extent, a classification of his own, but the distinction of such powers as memory, imagination, and reason cannot be held as merely artificial. The faculties are frequently grouped in a threefold division, as those of emotion, intellect, and will. For an account of the several powers of the mind see the articles Emotion, Imagination, Intellect, Intuition, Memory, Perception, Sensation, Will.

MINDANAO, or Magindanao, one of the Philippine Islands, and next to Luzon in point of size, of a triangular form, about 300 miles long and 105 broad, with many deep bays; discovered by the Spaniards who accompanied Magellan in 1521. It lies south-east of Manilla, at the distance of 600 miles. The Spaniards occupy the north portion of the island, divided into the provinces of Carago and Misamis (the former yielding most gold of any district in the Philippines), with a small tract at its south-west extremity, the remainder of the island being under the Sultan of Mindanao, although some of the chiefs are nearly independent. All the country, except upon the sea-coast, is mountainous; the mountains are of great height, and in the centre are some volcanoes. In 1873

an eruption of one in the Cordillera of Bareval destroyed three villages. Lakes are numerous. The vegetation and zoology of the island resemble those of the other Philippines. Spanish population estimated at 50,000; total of the island at 1,000,000.——MINDANAO, the principal town and the residence of the sultan, is on the Pelangy, about 6 miles from its mouth. See PHILIPPINES.

MINDEN, a town of Prussia, province of Westphalia, on the left bank of the Weser, here crossed by a bridge 600 feet long and 24 feet broad, 35 miles W.S.W. Hanover. It is one of the oldest towns in Germany, and the streets in the older parts are narrow and crooked. It has a fine cathedral of the thirteenth century, in the early pointed Gothic style, other six churches, a gymnasium, and an orphan hospital; manufactures of tobacco, chicory, chemicals, soap, lamps, machinery, &c., and an important transit and general trade. Minden is the seat of several important courts and public offices. It was the residence of several of the early German emperors, and many diets have been held at it. Pop. (1881), 17,867.

MINDORO, one of the larger of the Philippine Islands, of which it forms a province. It lies south of Luzon, from which it is separated by the Strait of Manilla, about 6 miles wide; and is about 110 miles long by about 53 broad. It is mountainous throughout, and evidently volcanic. The climate is hot and unhealthy, the rain almost incessant, and in consequence the vegetation is rank. Rice, cacao, and wild cinnamon are among the products. Pop. 15,000.

MINE, in modern military language a subterraneous passage dug under the wall or rampart of a fortification, or under any building or other object, for the purpose of blowing it up by gunpowder. The gunpowder is in a box, and the place where the powder is lodged is called the *chamber* (in French, *fourneau*). The passage leading to the powder is termed the *gallery;* the line drawn from the centre of the chamber perpendicularly to the nearest surface of the ground is called the *line of least resistance*. It has been found by experience that the figure produced by the explosion is a paraboloid, and that the centre of the powder, or charge, occupies the *focus*. The pit, or hole made by springing the mine, is called the *excavation*. The fire is communicated to the mine by a pipe, or hose, made of coarse cloth, whose diameter is about an inch and a half, called a *saucisson* (for the filling of which near half a pound of powder is allowed to every foot), extending from the chamber to the entrance of the gallery, to the end of which is fixed a match, that the miner who sets fire to it may have time to retire before it reaches the chamber. The saucisson is laid in a small trough, called an *auget*, to prevent it from contracting any dampness. This is made of boards. The mines of a fortress are called *countermines*, the gallery of which runs under the covered way along the outer margin of the fosse. From this, ramifications, called *rameaux*, extend under the glacis, from which again little passages are made on both sides, to afford means for listening and finding out the enemy's subterraneous movements. If the powder is lodged so deep under the ground that its explosion is not perceptible on the surface, it yet shakes the ground all round, and destroys the hostile mines in the neighbourhood. This is the *globe de compression*, invented by Belidor. The miners are often armed with short weapons, as pistols and cutlasses, in order to defend themselves if they should strike into a hostile mine. The mines are often so long that it is necessary to convey fresh air by artificial means to the most advanced workmen, and those who faint are passed back from one to the other; the same is done with the dead, if a combat ensues below. Frequently, also, balls, made of all kinds of substances which produce an offensive smoke, are lighted in order to stop the enemy, provided the mine permits the party who leave the ball an easy retreat. Sometimes mines are dug in the field with a view of blowing up such of the enemy as can be allured to the spot. In such cases a small body of men must sometimes be placed there in order to induce the enemy to attack them; these are sacrificed with the enemy. The use of mines in war is much older than the invention of gunpowder.

MINE, an excavation for obtaining minerals from the bowels of the earth. According to the Coal Mines Regulation Act, 1872, the 'term *mine* includes every shaft in the course of being sunk, and every level and inclined plane in the course of being driven for commencing any mine, or for searching for or proving minerals; and all the shafts, levels, planes, works, machinery, tramways, and sidings both below ground and above ground, in and adjacent to a mine; and any such shaft, level, and inclined plane, and belonging to the mine.' Such is now the legal definition of the word mine. This term is, however, locally applied in somewhat different senses. A bed of coal, or a seam of coal is, in the Lancashire and Shropshire districts, spoken of as a *mine* of coal; and it is not unfrequent, especially in the iron-producing districts of Wales, in Dean Forest, and in Lancashire, to speak of iron ore as *mine*. The manager of a blast-furnace, describing its contents or 'charge,' will say, He uses so many tons of Cumberland or Cornish ore, and so many tons of *native mine*, meaning the iron ore of his own locality.

It will be observed that according to the above parliamentary definition of a mine it is necessary that a shaft should have been sunk or a level driven to constitute a mine; but any working for minerals, 'open to day,' as the phrase is—as for tin in 'stream works' or alluvial deposits, or where the miners have commenced workings on the outcrops of a lode or seam, and followed it by forming a deep chasm, is, in ordinary language, a mine.

Minerals, especially the ores of the metals, are found usually in fissures or cracks in the rocks, which have been filled in with earthy and metalliferous deposits. These are called mineral veins or lodes, and according to their characters they are known as rake veins or lodes, pipe lodes, flat lodes or floors, carbonas, and other names in different localities. The metalliferous minerals are also sometimes found disseminated through the rocks themselves, and occasionally they are aggregated into masses in cavernous spaces, which had been previously formed in the rocks. Iron ores are not unfrequently found under those conditions. The Whitehaven red hematite is invariably found deposited in such water-worn caverns between the limestone and millstone grit; and the iron ores of Ulverstone are deposited either in shallow fissures, on the beds of ancient lakes, or in vast hollows. The argillaceous, or 'clay-band' iron ores, and the celebrated 'black-band' iron ores of Scotland, are found in beds usually interstratified with the coal and shale of the coal-measures. Coal, with the exception of the anthracite beds near Bideford, and one or two other unimportant localities, is always found in beds. These have evidently been formed in estuaries, lakes, or basins, the vegetable matter from which they have resulted undergoing its peculiar change either in deep or shallow water, as will be seen in the section of Dean Forest coal-field in fig. 1, Pl. CXXVI. The coal seams often retain the evidence of their having been deposited in these basin-like hollows, though frequently they have been disturbed since their formation, and thrown into positions more or less vertical.

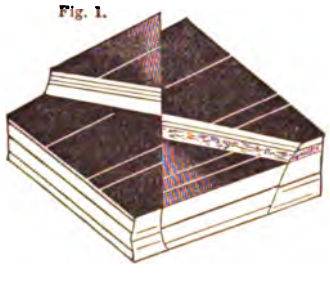
This dislocation of the beds of coal is well shown in the section given from the Somersetshire coal-field in the plate referred to.

Some descriptions of the minerals found in different countries will be placed under their respective heads.

In illustration of the various phenomena presented by mineral veins, or minerals deposited in beds and subsequently either moved by disturbances of the strata or worn down by denudation, a series of models have been constructed by Mr. T. Sopwith, which cannot be too strongly recommended for the purposes of instruction. Our space will only admit of our introducing a brief notice of two of these models.

Fig. 1 is the surface of a dislocated seam of coal supposing the superincumbent strata to have been removed. The vein represented by white wood is the first-formed vein. It hades or inclines with the bottom to the east, and the strata on the east side are thrown down 40 feet. Subsequently a second vein has been formed, whence further dislocation ensued, by which the rocks on the east side of the newly-formed vein have been thrown up 70 feet; and hence the seam of coal, which was originally a regular

Fig. 1.



plane, like that shown in Fig. 2, is separated into four parts, and taking the highest portion for a datum, one part is 40 feet, another 70 feet, and another 110 feet below it.

Some phenomena of mineral veins are well explained by the model represented in Fig. 2. The ver-

Fig. 2.

tical cliffs caused by displacement of the strata have been removed by extensive denudation. The intersection of veins on such a denuded surface is often an extremely complicated problem, of which this model is an example. In one part of the model it is seen that the mineral vein, nearly vertical, is scarcely to be distinguished from the horizontal strata, but the true relations are apparent on examining the edges of the model.

Mines usually belong to the owner of the soil underneath which they lie, but sometimes the owner of soil is not the owner of the minerals found beneath it.

In England, Scotland, and Ireland mines of gold and silver belong by prerogative to the crown. Such mines are designated 'Mines Royal,' and are thus defined—'When the ore does not yield so much gold and silver as will exceed the cost of refining and the loss of the baser metal, it is called a *poor mine;* but when the ore yields gold or silver to an amount which will exceed the charge of refining and the loss of the baser ore, it is called a *rich one*, or a *Mine Royal*, and is appertaining to the king by his prerogative' (Fodinæ Regales, fol. ii.) There is a difference between English and Scotch law, in that the former does not grant to the crown any claim to a mine merely in consequence of there being an admixture of gold or silver in the ore produced for it; while the latter assigns all gold mines without limitation, and also lead mines from which silver to the value of 1½*d.* to the pound of lead may be extracted. The English law, although it does not allow to the crown a complete right to mines containing an admixture of gold and silver, yet grants a right of pre-emption at a fixed rate in the case of ores drawn from such mines, except tin mines. A land proprietor may dig mines in his own land, but if he digs under that of his neighbour he is guilty of trespass. A tenant for life may work open mines, or sink new shafts in working old veins, but he may not open new mines.

The most recent acts passed to regulate the working of mines in the United Kingdom are 35 and 36 Victoria, cap. lxxvi., 35 and 36 Victoria, cap. lxxvii., and 38 and 39 Victoria, cap. xxxix., the first relating to mines of coal, stratified ironstone, shale, and fire-clay, and the second and third to metalliferous mines. The provisions in the three acts are similar. The chief difference is that while no boys under twelve years of age are allowed under any circumstances to be employed below ground in metalliferous mines, boys may be employed as young as ten in certain of the mines to which the first of the three acts applies, when the permission of the secretary of state has been procured for such employment. The ration of the weekly and daily work of all boys under sixteen is fixed according to their age. The length of the periods of rest is also fixed for boys under sixteen. Provision is made for the education of boys below twelve who are employed below ground. No woman or girl may be employed under ground at all. No child may be employed above ground under ten years of age; and the regulations as to the duration of labour and rest applicable to boys under sixteen working below ground are applicable to all who are employed under that age above ground. No woman or young person under sixteen years of age may be employed between the hours of nine at night and five in the morning, nor on Sunday, nor after two o'clock on Saturday afternoon. This last provision, however, does not apply to certain mines in Ireland which are specially exempted in writing by the secretary of state. The owner of a mine must keep a register of the boys, women, and children employed in it. Wages are not to be paid in public-houses. No single shafts are to be used except in certain cases specified in the act. Every mine is to be under the management of a certificated manager, and provisions are made for the conduct of examinations of applicants for managers' certificates. Rules are given prescribing the manner in which mines are to be ventilated, places not in use fenced, and making various other provisions for preserving the health and safety of the miners. A daily inspection of every mine by a competent person is directed to be made. Special rules are framed referring to the inspection of mines, arbitrations in connection with mines, and coroners' inquests held over any person or persons whose death has been caused by any explosion or other accident in a mine.

MINE INSPECTION. Several explosions of fire-damp, which were attended with serious loss of life, having occurred in some of our large collieries, public attention was forcibly drawn to the conditions

of extreme risk under which our coal-miners laboured. It was felt by every one that something should be done by which the production of coal might be secured without those dreadful casualties by which it was too commonly attended. This was so forcibly expressed that the government, in June, 1849, instituted an inquiry into the existing methods of working, lighting, and ventilating collieries. The especial purpose of this being to determine, if it were possible to introduce improvements, and to compel the adoption of precautions and remedies which might be applied to the operations of a colliery with the hope of mitigating the dangers by which they were attended. This inquiry was placed in the hands of John Phillips, the accomplished geologist, and of J. Kenyon Blackwell, a gentleman having great experience in practical coal-mining. In 1850, after an extensive inquiry, a report was furnished to the Secretary of State, recommending the adoption of certain stringent regulations which it was thought could only be effectively carried out under a system of government inspection, and consequently An Act for Inspection of Coal-mines in Great Britain passed the House of Commons on the 14th August, 1850, and in November of that year three inspectors were appointed under that act. An Act for the Regulation and Inspection of Mines received the sanction of Parliament on the 20th August, 1860, by which an act to prohibit the employment of women and girls in mines and collieries, and to regulate the employment of girls, passed in the fifth and sixth years of her majesty's reign, and the act of 1850, were consolidated, and the provisions for inspection previously applicable to coal-mines only were extended to mines of ironstone in the coal-measures. Eventually the Home Secretary, with whom the power of appointment rested, increased the number of the inspectors of collieries to twelve, which is still the number of chief coal inspectors; but after the passing of An Act to Consolidate and Amend the Acts relating to the Regulation of Coal-mines and certain other Mines, on the 10th of Aug. 1872, twelve assistant-inspectors were appointed. At the same time An Act to Consolidate and Amend the Law relating to Metalliferous Mines was passed. By this all mines, other than collieries, were also brought under inspection, and two inspectors were especially appointed for this particular duty, one of them having charge of all Cornwall, Devonshire, and Somersetshire; and the other of all Wales, the mines of the Midland Counties, those of Cumberland, Westmoreland, Durham, and Northumberland, the Isle of Man, and Scotland. The mines and collieries of Ireland were placed under the charge of the inspector of East Lancashire, and a few isolated metal mines were comprehended within the districts assigned to certain coal-inspectors. By these acts the employment of women and children was carefully regulated, the payment of wages arranged, the examination of all colliery managers insisted on, the duties of the inspectors very fully defined, and many other points of great importance, as securing the safety and preserving the health of all working in collieries and mines, were made the subjects of careful consideration, and in many cases of stringent enactments. The inspector has large powers. He may enter, inspect, examine, and inquire into mines and their belongings, with liberty to inspect certain books, plans, and documents which the act prescribes shall be kept by the mine owner. To the inspector the mine owner is required to send the special rules they make for the management of their mines, and certain prescribed annual returns. He must also be informed when a mine is abandoned or its workings suspended, and be furnished, for the Secretary of State, with a plan of such abandoned colliery or mine, showing the working boundaries. That mine inspection has its value is evident, for since the commencement of inspection, amongst many fluctuations, a gradual improvement can be traced. The chief diminution of accidents has been in explosions of fire-damp and breakages and falls in shafts; and there is some, although but a small, improvement in the fatal casualties, arising from falls of roof and of coal.

MINERAL CAOUTCHOUC. See BITUMEN.

MINERALOGY, or THE NATURAL HISTORY OF THE MINERAL KINGDOM, considered as a pure science, is of very recent date. The observations made at first related simply to the usefulness of minerals to the purposes of society, and it was not before the lapse of many ages that they came to be investigated on account of their great variety and the beautiful arrangements of which they are susceptible. The *orukta* and *metalleuta* of Aristotle evince no valuable observations on the part of that philosopher concerning minerals, and are chiefly mentioned by him because he believed the former to be derived from the earth, and the latter from water. The allusions to mineral substances found in the writings of Theophrastus, Pliny, Dioscorides, and Galen, are of more interest to the antiquarian and philologist than to the natural historian. No attempt to classify these bodies was made previous to the introduction of alchemy into Europe by the Arabians; and to Avicenna belongs the merit of the first arrangement. He divided minerals into stones, metals, sulphureous fossils, and salts—a division which was generally adopted by the chemists of those times, though opposed by the naturalists, who confined their investigations to the characters derived from the external forms of minerals, and their supposed medicinal virtues, but without deriving from them any just grounds of classification. According to one or the other of these vicious methods was the science of mineralogy treated down to the sixteenth century, its cultivators either implicitly adopting the ideas of the chemists or announcing themselves as little better than mere empirical collectors of curiosities.

Agricola (who was born in 1494, and died in 1555) directed his views to the uniting these two classes, though he inclined more strongly to the side of the scholiasts than to that of the chemists. All minerals (*corpora subterranea*) are divided by him into *simple*, or such as consist of homogeneous particles, and *compounded*, or such as are formed of heterogeneous parts, taken in a mineralogical acceptation of the terms. The minerals belonging to the former of these divisions are found in four different forms, viz. 1, *terra;* 2, *succus concretus;* 3, *lapis;* 4, *metallum.* *Terra* he defines as 'corpus fossile quod potest manu subigi, cum fuerit aspersum humore, aut ex quo cum fuerit madefactum, fit lutum.' These earths he divides partly according to some external characters, partly after their localities, in cases where their names are derived from the countries or places in which they are found:—'Succus concretus est corpus fossile siccum et subdurum, quod aquis aspersum aut non mollitur, sed liquescit, aut, si mollitur, multum vel pinguitudine differt a terra, vel materia ex qua constat.' The fossils of this class Agricola divided into *macra* and *pinguia*. The former consist of a juice, partly mixed with earth (*sal nitrum*), partly with metal (*chrysocolla, ærugo, ferrugo, cæruleum*), partly mixed both with earth and metal (*atramentum, sutorium, alumen*, &c.); to the latter he refers sulphur, bitumen, sandarach, and auripigmentum. The stones are the third class of Agricola's system. 'Lapis est corpus fossile siccum et durum, quod vel aqua longinquo tempore vix mollit, ignis vehemens redigit in pulverem; vel non mollit aqua, sed maximo ignis liquescit calore.' The stones are subdivided into

lapis, gemma, marmor, and *saxum.* His definition of metals, being his fourth class, is 'corpus fossile natura vel liquidum vel durum quidem, sed quod ignis liquescit calore.' He enumerates ten metals. The last class of Agricola's system comprehends mixed and compound fossils:—1. Mixtures of stones and juices (*succi*); 2, of earth and metal; 3, of stone and metal; 4, of juice, stone, and metal. To the second and third divisions he refers the various ores. A translation of Agricola's system into German was published, with considerable additions, by Lehmann, at Freyberg, in 1809.

Most of the writers on mineralogy who succeeded Agricola until the middle of the following century adopted his system, occasionally making some trifling alterations, in conformity with the slow progress of chemistry. Becher (whose Physica Subterranea was published in 1667) made the first important innovation upon the classification of Agricola. He considered water and earth as the remote, and vitreous, inflammable, and mineral earths (*sal, sulphur, mercurius*) as the proximate constituent parts of all minerals, which he accordingly arranged under three classes; the first comprehending those stones in which the vitreous earth constitutes the principal ingredient; the second and third class containing the substances in which the two remaining earths predominate. Bromelius, who published a book entitled Catalogus Rerum Curiosarum (Gothenburg, 1698), referred sulphur and the bituminous substances to the same class, which he called *sulphurea* and *pinguia.* Magnus von Bromel, a Swede, who was the pupil of Boerhaave, published a system of mineralogy—Inledring til Kunscah om Mineralier, &c. (Stockholm, 1730), in which he not only availed himself of all the improvements made by his predecessors, but also proposed a new chemical division of stony substances into such as are refractory (*apyri*), or calcinable, or vitrescible in the fire, to which were added the figured stones (*figurati*).

After Von Bromel, the great Swedish reformer in natural history appeared, whose admirable views respecting the philosophy of the natural sciences have contributed more to the perfection of our science than the labours of all who preceded him; and yet Linnæus appears to have possessed but very little knowledge of minerals, but the success with which he applied the method of natural history to the vegetable kingdom rendered it easy for subsequent naturalists to apply his principles to the mineral kingdom. Linnæus, too, has the merit of calling the attention of naturalists to the important characters derived from diversity of crystallization. Mineralogy, however, remained from the time of Linnæus to that of Werner almost exclusively in the hands of chemists, who appear to have regarded the science in no other light than as an appendage of chemistry, and who, while they paid little regard to the natural properties of minerals, believed that chemical knowledge was alone capable of affording the basis of the classification, nomenclature, and diagnosis of the mineral kingdom. To this class of the cultivators of mineralogy belonged Henkel, Pott, Wallerius, and Cronstedt.

In 1774 Werner published his work On the external Properties of Minerals (Von den äussern Kennzeichen der Fossilien)—a work of great merit and value at that juncture, as it served to call the attention of naturalists to a much-neglected method of arriving at a knowledge of this department of nature. The external characters of minerals had before been almost wholly overlooked; in this work they were described with uncommon minuteness, though they were employed by him in his system without a just regard to their relative importance. The greatest defect, however, in the views of Werner arose from his reluctance to ascertain the properities of minerals through the aid of instruments. He scarcely availed himself of any other means than such as were derived directly through the eye, the hand, and the tongue. Hence those characters depending upon the value of angles and different degrees of hardness and specific gravity, which are now acknowledged to be of the highest value in mineralogy, were turned to comparatively little account. For a knowledge of Werner's system of mineralogy we are indebted to his translation of Cronsted's mineralogy (to which he subjoined notes), to his catalogue of the mineral collection of M. Pabst von Ohain, and to several memoirs in the Bergmannische Journal. In addition to these sources several expositions of his system have been made by his pupils, the best of which is that published by Professor Jameson.

The fundamental principle laid down by Werner in the classification of minerals is their *natural affinity,* which he allows to be founded on the chemical nature of their component parts. These he distinguishes into essential and accidental component parts, of the former of which only does he take notice in his arrangement. The essential component parts are subdivided into predominant and characteristic ones, and generally the characteristic happen to be, at the same time, the predominant constituents. His classes are four—which are founded on what he calls the 'fundamental constituent parts,' viz. the earthy, saline, inflammable and metallic, each class being named after that fundamental constituent part which predominates in and characterizes it. Thus he derives his classes of earths, salts, inflammables, and metals. These classes are subdivided into genera, which are founded upon the variety in the component parts of the minerals comprehended in each class, there being as many genera as there are predominating, or at least characteristic constituent parts discovered in their mixture. But neither Werner nor his pupils have been very strict in adhering to this rule for the formation of the genera these, as well as the species, having more frequently been established by them upon the natural instead of the chemical properties.

Mineralogy is under immense obligations to the Abbé Haüy for his researches respecting the geometrical character of minerals, which were presented to the mineralogical world at the commencement of the present century. His labours connected with crystallography gave an entirely new aspect to the science, and communicated to its results a degree of that precision and certainty which belong to geometry. He defines a species in mineralogy to be 'an assemblage of bodies, the integrant molecules of which are similar to each other, and have the same composition.' The following outline of Haüy's system is taken from his Traité de Minéralogie (Paris, 1822): —*Class I.* Free acids. *Class II.* Metallic substances, but destitute of a metallic appearance. This class contains eight genera, namely, lime, barytes, strontites, magnesia, alumine, potash, soda, and ammonia; and to it is subjoined an appendix, consisting of one order characterized by the presence of silex in all its compounds, and which embraces a larger number of species than the whole class to which it is appended. *Class III.* True metallic substances. This class contains eighteen genera, characterized by the different metals. *Class IV.* Unmetallic, combustible substances.

In proceeding to notice the labours of Professor Mohs, we come to an era in the history of mineralogical science. This naturalist, no less distinguished as a cultivator of the mathematics than of mineralogy, published at Dresden, in 1822, his Grundriss der

Mineralogie. His first object is to attempt to fix the exact limits of mineralogy. He then proceeds to develop the science under the following heads:—1, terminology; 2, theory of the system; 3, nomenclature; 4, characteristic; 5, physiography. Under the first of these he explains those properties of minerals which manifest no change, either in the properties themselves, or in the substances which possess them during their observation or examination. They had before been treated of under the denomination of external or physical characters, though, from the stress which had been laid upon chemical characters, the greater part of them had been but very imperfectly determined; and this part of the subject is called *terminology*, because, besides the general investigation of those properties, it embraces also the explanations of the expressions which, for the sake of precision, are used in a determinate and peculiar sense. Decomposed and imperfectly formed minerals, or those which are destitute of several of the properties peculiar to these bodies, are not regarded as suitable objects for the consideration of the science; in which respect they are treated like mutilated, defective, or monstrous plants or animals in botany and zoology. And in order to study the productions of the mineral kingdom in their purest state, Mohs takes notice of those properties which belong to minerals occurring in single individuals, separately from those which belong to several individuals of the same quality, formed in a common space, one being the support of, or at least contiguous to, the other—of the former of which only does he make use in the determination of the species, while he pays no attention to the properties of minerals composed of individuals belonging to different species (mixed minerals), these last falling within the province of geology. According to this system, the individual of the mineral kingdom, or the simple mineral, is the sole object of mineralogy, and the natural properties of the simple mineral are the only ones to which, in this science, we ought to direct our attention. Mohs has particularly distinguished himself in treating of that part of terminology which relates to the regular forms of minerals. The fundamental forms, from which he derives all the occurring forms among minerals, are but four in number, namely, the scalene four-sided pyramid, the isosceles four-sided pyramid, the rhombohedron, and the hexahedron; and the geometrical constructions by which he illustrates the simple forms capable of appearing in the individuals of one and the same species, or which may produce combinations with one another, entitle him to the first rank as a crystallographer. But one of the greatest improvements was the establishment of an accurate scale for the degrees of hardness. This was effected by choosing a certain number of suitable minerals, of which every preceding one is scratched by that which follows it, while the former does not scratch the latter; and the degrees of hardness are expressed by means of numbers prefixed to the different individuals of the scale. Thus

1	expresses the hardness of	talc;
2	. . . . .	gypsum,
3	. . . . .	calcareous spar;
4	. . . . .	fluor spar;
5	. . . . .	apatite;
6	. . . . .	feldspar;
7	. . . . .	quarts;
8	. . . . .	topaz;
9	. . . . .	corundum;
10	. . . . .	diamond.

The second general head under which mineralogy is developed, according to Mohs, is the *theory* of the system, which contains the reasoning or philosophical part of the science. It determines the idea of the species; fixes the principle of classification; and upon the idea of the species it founds, according to this principle, the ideas of the genus, the order, and the class; and lastly, by applying all these ideas to nature, the outline of the system thus constructed is furnished with its contents, in conformity to our knowledge of the productions of nature, as obtained from immediate inspection. The principle of classification consists in the resemblance of natural properties, since in every science the classification must rest upon such relations as are objects of the science. On the different degrees of resemblance are founded the higher ideas of the theory of the system. An assemblage of species connected by the highest degree of natural-historical resemblance is termed a *genus;* an assemblage of similar genera an *order;* of similar orders a *class;* and the collection of these ideas conformably to the degree of their generality, and applied to the productions of the mineral kingdom, constitutes the *mineral system.* The mineral system is therefore the systematic exhibition of the natural resemblance as observable in the mineral kingdom, or of the connection established by nature among its products by means of this resemblance. For this reason it is called the *natural system*, because, in fact, it expresses nature in this very remarkable relation.

The third idea of the science, as developed by Mohs, is its nomenclature, which relates to the connection of its unities with certain words, through which the ideas and representations may be so expressed as to be conveniently applied in writing and speaking. The order is the highest idea expressed in the nomenclature of Mohs, and in the selection of the names of the orders he has invented but two which are entirely new, having employed as many designations from ancient mineralogy as would answer the purpose. The names receive their signification in agreement with the ideas of the orders; thus *pyrites* embraces the minerals hitherto called by that name. A mineral which may with propriety bear the name of a *metal* must really be a metal, or it must present the properties peculiar to metals. Mica signifies a mineral which may be cleaved with facility into thin, shining laminæ; the order mica therefore contains only such species as present cleavage in a high degree of perfection. The name of the genus is a compound name, formed by connecting another word with the name of the order. Thus we have *lead glance, augite spar, iron pyrites.* The generic name also refers to the properties of the genus, and expresses, as much as possible, some striking feature of its resemblance with other bodies. Such is the name *garnet-blende.* The genus designated by this name belongs to the order *blende;* the individuals which it contains very often look like garnet. The denomination of the species is produced by the nearer restriction of the generic name by an adjective. The adjective with which the species is designated within its genus is taken from its natural properties, and in general refers to one of those properties of the species which is most useful in distinguishing it from other species of the same genus; hence the systems of crystallization and the relation of the cleavage are the most frequently employed—examples of which are hexahedral, prismatic, rhombohedral, iron pyrites; rhombohedral, octahedral, dodecahedral, prismatic, iron ore, &c.

The terminology, the theory of the system, and the nomenclature form the constituents of theoretical mineralogy, according to Mohs' system. Practice, or the application of it to nature, requires the characteristic, the object of which is to furnish us with the peculiar terms or marks by which we are able to distinguish objects from each other, so far as they are comprehended in the ideas established by

the theory of the system. In order to find the name of a mineral when its properties are ascertained, we make use of the characteristic, which consists of an assemblage of general ideas corresponding to the system, and expressed by single distinctive marks. With these ideas are connected the names and denominations as far as the nomenclature extends and requires, not above the order, nor below the species; and they are by degrees transferred to the individual, in proportion as it enters within the compass of those general ideas. The characteristic is only useful when we have the mineral in our hands, and is not to be studied to obtain a knowledge of the contents of the mineral kingdom, since the characters of its classes, orders, genera, and species, consisting of single marks or properties, are not calculated to produce representations or images of the objects to which they refer. *Physiography*, the last head of scientific mineralogy, consists of the assemblage of the general descriptions, and is intended to produce a distinct image of minerals. We cannot, by its assistance, find the place of a given mineral in the system, or, in other words, recognize it; for it is independent of that connection, among minerals, upon which the system is founded. Mohs was the first writer who drew the line between the determinative and the descriptive parts of mineralogy.

This system of Mohs claimed to be a natural system, which rendered mineralogy a science complete in itself; it certainly classified minerals from its own point of view, but how limited was this! Mohs' system was based upon far too narrow a foundation, which was exactly the fault of those purely chemical systems which preceded it. Mohs' so-called natural groupings were the results of one single idea, whereas, to gain a just view of the mineral world, we must take into account all the points of contact between mineralogy strictly so-called and the allied sciences. The basis of the modern systems of mineralogical classification is to be found in the relations of the elements which constitute the minerals. In order to study these relationships a knowledge of chemistry is clearly essential. But the formation of mineralogical classes is dependent not only on a study of the elements and of their chemical arrangement, but also on a study of the outward form assumed by the minerals, that is, upon their crystallographic shapes. But further, minerals are acted on by, or they themselves exert an action on light; their densities vary; they are of different degrees of hardness; they are affected by electricity; their fracture is not invariable; their odour, taste, and state of aggregation all vary. To arrive at a just classification of minerals all these points must be taken into account. And this it is that makes mineralogical classification so varied, different observers being led to give differing degrees of importance to the same characteristic; thus in one system the crystallographic form is made the one essential for determining the place of a mineral in the general scheme, in another the chemical composition is all in all, in a third the physical state, and so on; but as we have seen, modern mineralogy more and more tends to regard *all* these points as important, and to form its scheme of classification only after a careful study of them all. To understand aright the science of mineralogy a knowledge of chemistry, upon which the general divisions of mineral substances are based; of crystallography, by means of which many curious relationships between minerals become apparent; of optics, the laws of which science regulate the colour and lustre of all minerals; of physics in general, influencing especially the hardness, specific gravity, and fracture of minerals; and lastly, of geology, as a guide to the localities in which minerals occur, is absolutely necessary; and the more we know of these cognate sciences the more able shall we be to understand the teachings of mineralogy.

The general subdivisions in the classification of minerals adopted by Dana, in the last edition of his work on Mineralogy, are as follows:—

I.—Native Elements.

Series 1.

1. Gold group. 2. Iron group. 3. Tin group.

Series 2.

1. Arsenic group.
2. Sulphur group.
3. Carbon-silicon group.

Series 3.

1. Chlorine, bromine, iodine group.
2. Fluorine group.
3. Oxygen group.

II.—Compounds.

The more negative element an element of series 2 (above).

1. Binary.	2. Binary	3. Ternary.
Sulphides, &c., of a class of sulphur and arsenic groups.	*Sulphides, &c., of metals of gold, iron, and tin groups.*	*Sulpha-salts* *Salts analogous to Sulphobismuthides.*

III.—Compounds.

The more negative element an element of series 3, group 1 (above).

Chlorides. Bromides. Iodides.

IV.—Compounds.

The more negative element an element of series 3, group 2 (above).

Fluorides.

V.—Compounds.

The more negative element an element of series 3, group 3 (above).

1. *Oxides.* 2. *Silicates, Titanates, Nitrates, Borates, &c. &c.*

VI.—Hydro-Carbon Compounds. Minerals of Organic Origin.

MINERAL WATERS. See Water.

MINERVA.—1. A daughter of Jupiter, and one of the great divinities of the ancient Romans. Her name is supposed to be of the same root with *mens*, and if this is correct she must be regarded as especially the representative of the intellectual powers. In dignity she stood next to Jupiter and Juno, beside whose statues hers had a place in the temple on the capitol. Like the Greek goddess Athena, the daughter of Zeus, she was a virgin goddess. She

was looked upon as the patroness of all arts and trades, and at her annual festival, called Quinquatrus, which lasted from the 19th to the 23d of March inclusive, her aid was sought by all those who wished to excel in any particular art, whether intellectual or mechanical, or partly the one and partly the other. She was also believed to protect warriors in battle, and was hence represented with a helmet, shield, and coat of mail. To her was ascribed the invention of numbers, and of musical instruments, especially wind-instruments, which were therefore annually subjected to a sort of purification on the last day of the festival of Minerva. The temple already mentioned on the capitol was probably the oldest of those dedicated to Minerva. There was another dedicated to her alone on the Aventine.——2. A Greek goddess, properly called ATHENA, but very often spoken of as Minerva, on account of the Romans having identified her with their goddess of that name. Nearly all the legends respecting her agree in calling her a daughter of Zeus, but some make her the daughter of Pallas, and others held her to have been of Libyan origin, the daughter of Poseidōn and Tritonis. These variations must have arisen from the identification of Athena with other divinities, and applying to her the traditions properly belonging only to these. According to the fable found in Hesiod, Zeus having obtained the sovereignty of the skies by his victory over the Titans, chose Metis, daughter of Ocean, for his wife. An oracle of Gæa and Uranus had, however, predicted that Metis would first bear him a daughter, and then a son, who should deprive him of the sovereignty. To avoid this Zeus endeavoured, by wiles and flattery, to get possession of her person, and then swallowed her with her yet unborn daughter. When the period of her delivery arrived Zeus experienced a sharp pain in his head, and having caused Hephæstus to split open his skull, was astonished at the sight of a virgin in complete armour, who danced about with a warlike enthusiasm, brandishing her spear and clashing her arms, as if on the point of attacking an enemy. In her character of a wise and prudent warrior she was contrasted with the fierce, furious, and bloodthirsty Ares, and made her first appearance in the battles of the gods. In the wars of the giants she slew Pallas and Enceladus. In the wars of mortals she aids and protects heroes. She conducted Heracles to Olympus, instructed Bellerophon (see HIPPONOÜS) how to tame Pegasus and conquer the Chimæra, accompanied Perseus on his expedition against the Gorgons, conferred immortality on Tydeus, honoured Achilles, accompanied Ulysses, protected his wife, and guided his son Telemachus under the figure of Mentor. She also favoured the inventors of warlike instruments, built the Argo, and taught Epeus to construct the wooden horse by means of which Troy was captured. She is likewise represented as the patroness of the arts of peace; and as a virgin is distinguished for her skill in all the employments in which, in the heroic age, the daughters of kings occupied themselves. The loom, the spindle, the embroidering needle, are her attributes; and as the wives of the heroes prepared the garments of their households, so she made the dresses of the goddesses; hence her epithet *Ergane* (the busy). Skilful artists were, therefore, under her protection, though she would not tolerate any marks of pride. All the peaceful arts which display an active and inventive spirit found a patron in her. The sculptor, the architect, and the painter, as well as the philosopher, the orator, and the poet, considered her their tutelar deity. As bodily health is necessary to the successful exertion of the inventive powers of the mind, she is also represented among the healing gods, and in this character is called *Paeonia*. In all these representations she is the symbol of the thinking faculty, the goddess of wisdom, science, and art; the latter, however, only in so far as invention and thought are comprehended. Athens, the city of the arts and sciences, was her favourite residence. She is also styled the inventress of the flute; but having seen, in a fountain, how much the playing upon that instrument distorted her face, she threw it into the water, with maledictions on the person who should take it out. Marsyas suffered the effects of this malediction. Despising love, she consecrated herself to perpetual virginity; and the unhappy wretch who directed towards her a glance of desire suffered the severest penalties for his rashness. Tiresias, who surprised her in the bath, was struck blind.

The arts have embodied this conception of pure reason in the images of the goddess. A manly gravity and an air of reflection is united with female beauty in her features. As a warrior she is represented completely armed, her head covered with a gold helmet, from which streams a crest of horse-hair, her hand bearing her lance, and her body mailed with the armour of her father. As the goddess of peaceful arts, she appears in the dress of a Grecian matron. To her insignia belong the Ægis, the Gorgon's head, the round Argive buckler; and the owl, as the symbol of vigilance, the cock, the serpent, an olive-branch, and a lance were sacred to her. As the preserver of health she is also represented as feeding a dragon, and the olive-branch is a symbol of the peaceful commerce which is rendered prosperous through her favour. An Athenian tradition relates that Poseidōn and Athena once contended which should give the name to their city; the gods, to decide the dispute, declared that it should be called from the one who should produce the most useful gift for the human race. Neptune, therefore, struck the ground with his trident, and the war-horse sprang forth; Minerva threw her spear, and from the spot where it fell sprouted forth the peaceful olive-tree. Her present was determined to be the most salutary, and the city received her name. All Attica, but particularly Athens, was sacred to her, and she had numerous temples there. (See PARTHENON.) Her most brilliant festival at Athens was the Panathenæa. Another festival was the solemn washing of her statues at Athens, and more particularly at Argos, which was done yearly in running water, by virgins.

MINGRELIA, formerly a separate province of Asiatic Russia, lying to the south of the Caucasus, and corresponding pretty closely with the ancient Colchis, now the northern part of the province of Kutais; area, about 2100 miles. It is mountainous, but very fertile. Its products are corn, wine, oil, millet, wood, silk, horses, and honey. The meaning of the name is 'land of the thousand springs.'

MINHO, a province of Portugal, the full name of which is ENTRE DOURO E MINHO, bounded on the north by the river Minho, which separates it from Galicia, in Spain; east by Galicia and the province of Tras-os-Montes; south by the Douro; and west by the Atlantic; area, 2706 square miles. The surface is generally mountainous, being traversed by ramifications of the Cantabrian chain. The principal river is the Minho, which forms its northern boundary. The most important products are wine, millet, flax, cork, and oranges. Numerous herds of cows graze on the pastures, and the province has long been famous for its pork. Game, both large and small, and fish, are very abundant. The principal manufactures are linen, hats, and cutlery. The most important export is wine. For administrative purposes Douro is divided into the three districts of Vianna do Castella, Braga, and Porto. Pop. (end of 1881), 1,014,768.

MINHO (ancient *Minius*), a river of the Iberian Peninsula, which rises in the Sierra Mondenedo, in the north-east of Galicia in Spain, flows circuitously south through a very mountainous country, passing the town of Lugo. About 6 miles above the town of Orense its volume is nearly doubled by the accession of the Sil, which joins it on the left; it flows thence south-west, passes the town of Ribadavia, forms part of the boundary between Spain and Portugal, and falls into the sea by two mouths, between which a small island is formed, after a course of about 150 miles. It abounds in salmon and lampreys.

MINIATURE, a painting in water-colours, of very small dimensions, and executed with peculiar delicacy. Its etymological meaning is painting in minium, which was the process first employed by the illuminators of the middle ages in tracing on manuscripts the red letters and ornaments at the heads of chapters. The name was still applied to that delicate kind of painting even when the most various colours had come to be employed in it, and when it had come to be employed in the decoration of large numbers of small articles in wood, ivory, and enamel, whence we obtain the present use of the word. Vellum and ivory are the materials most commonly used to paint miniatures on. The ground of the vellum or ivory is used for the highest lights, and some artists use no white colouring matter at all, supplying its place entirely by this ground. The best colours are those which have the least body, as carmine, ultramarine, lac, &c., which are dissolved in water and then separated and dried. Miniature painting requires much time, on account of the paints of which it consists, which must be delicately put on, so near each other that they appear as one continued colour. As early as the ninth and tenth centuries miniature pictures are found as ornaments of manuscripts in Italy, France, and Germany. In general this kind of painting was an occupation of the monks, and as the art was called *illuminare*, so the artists received the names *illuminatores* or *miniatores*. This species of painting flourished, particularly in the fourteenth century, under Charles V. in France, and reached still greater perfection under Charles VIII. and Louis XII. The most illustrious miniature painter of the sixteenth century was Giulio Clovio, an Italian monk, who united great brilliancy of colour with equal vigour of design. But it was in the eighteenth century that the art reached its highest development. The most noted names connected with it at that time are those of Klingstedt, a native of Riga; Arland of Geneva; Rosalba Carriera, a Venetian lady; Hall, a Swede; Liotard; Mengs; Füger, and Westermann. The most celebrated of the more recent miniature painters are Saint, Isabey, and Duchesne de Gisors.

MINIM, a character or note, equal in duration to one fourth of a breve, and one half of a semibreve.

MINIM FRIARS (from Latin, *minimi*, least), brethren of St. Franciscus a Paula (whence they are called also *Paulini* or *Paulani*), an order instituted in the middle of the fifteenth century, who have established convents in most European countries. They owe their reputation of particular sanctity to their rigorous fasting, as they are not allowed to take anything but bread, fruits, and water. Their dress is black, and like that of the Franiscans provided with a scourge. Their life is dedicated entirely to solitary devotion. They belong to the mendicant orders, and possessed, in the eighteenth century, 450 convents in thirty provinces. In the Neapolitan territory they are called *Paolotti*. See FRANCIS OF PAULA.

MINIMUM THERMOMETER, an instrument which exhibits its lowest temperature since last examined and set. Rutherford's is an alcohol thermometer with a horizontal tube, there is a small movable index of coloured glass surrounded by the alcohol of the tube, and when the instrument is set this index is at the end of the liquid column. When the temperature rises and the alcohol expands it flows past the index, so that this remains in its former position; when the alcohol contracts it resists any tendency of the index to break its terminal concave surface, so that the index is carried back until the temperature ceases to fall. Thus the index by its position registers the minimum temperature. The instrument may be set by inclining the tube. It is found that the vapour of alcohol filling the space in the upper part of the tube condenses at the end, and collects there, so that the temperatures indicated by the thermometer are too low. This defect in alcohol thermometers is very perceptible when the tube is horizontal. Casella has proposed a thermometer in which the superficial tension of the convex film at the end of a mercury column enables the minimum temperature to be registered; by the peculiar construction of his instrument the mercury is prevented from expanding along a certain fine tube when the temperature rises, whereas it freely contracts in this tube when the temperature falls, so that the minimum temperature is registered in the tube. Casella's thermometer is too sensitive, and the mercury is too easily shaken along the tube for the use of ordinary observers, some of these instruments requiring the nicest care in their handling.

Maximum and minimum thermometers are of great importance to meteorologists. It is found that the mean of the maximum and minimum temperatures during twenty-four hours is nearly always about half a Fahr. degree above the true mean temperature of twenty-four hourly observations. That there is any difference between the means is attributed to the latent heat given out by aqueous vapour when it condenses as dew, causing the minimum temperature to be higher than if there were no formation of dew. Again, a certain mean temperature may really represent two very different states of things. Thus, Madrid and Mentone had the same mean temperature, 72°·8 Fahr., in Sept. 1865, but their daily temperature ranges were very different; the minimum temperature in Madrid being 59°·5, and in Mentone 68°. The temperature range is of great importance to health and in agriculture; it is found to be least in winter, to increase rapidly in March and April to a maximum in June, diminishing rapidly in October and November; it is least in wet climates, the tropics, and the polar regions. Observers who use maximum and minimum thermometers, and who wish to co-ordinate their observations with those of the meteorological societies, will do well to note every month the following:—Highest and lowest temperatures in month, monthly range, greatest daily range, mean of all the highest, mean of all the lowest, mean daily range, mean temperature. For the adopted methods of placing the instruments, see METEOROLOGY.

MINING is the art of extracting minerals from their situations in the strata of the earth. There is reason to believe that it has been practised from the earliest periods of the world's history, and that the art of mining is coeval, or nearly so, with that of metallurgy. From a description given of a mineral fuel by Theophrastus (300 B.C.), it appears that coal was broken from its natural position in the earth at that period, and was doubtless excavated from shallow depths. The discovery of a flint axe stuck in a bed of coal in Monmouthshire, and similar discoveries near Stanley in Derbyshire, in old excavations, seem to prove that coal was extracted —probably from the outcrops—by some of the earliest inhabitants of those islands. In Lancashire, on the banks of the river Douglas, curiously

Fig. 1.

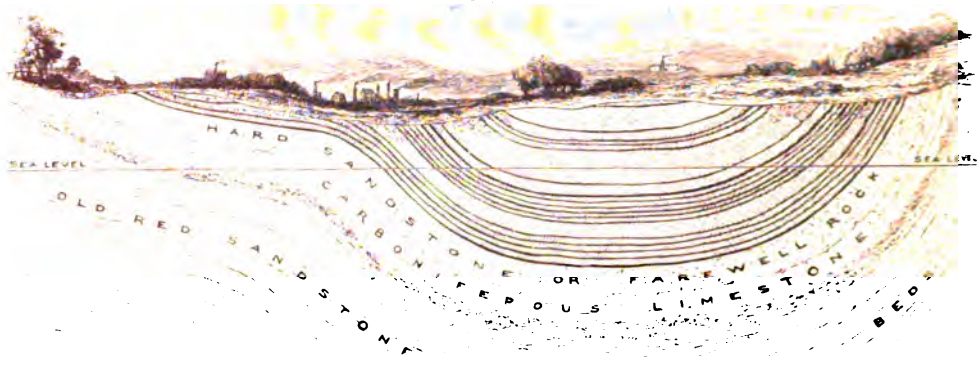


Fig. 2.

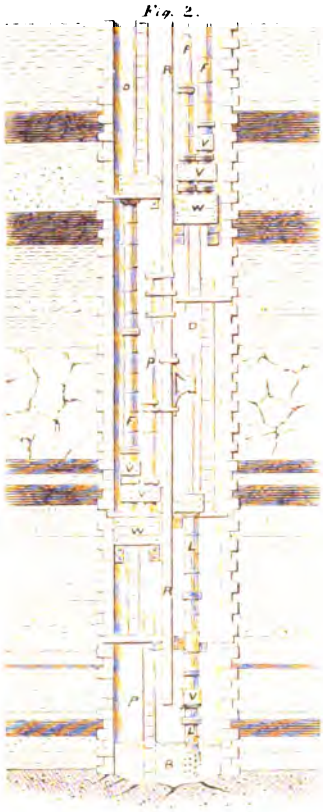


Fig. 3.

Fig. 4.

Fig. 5.

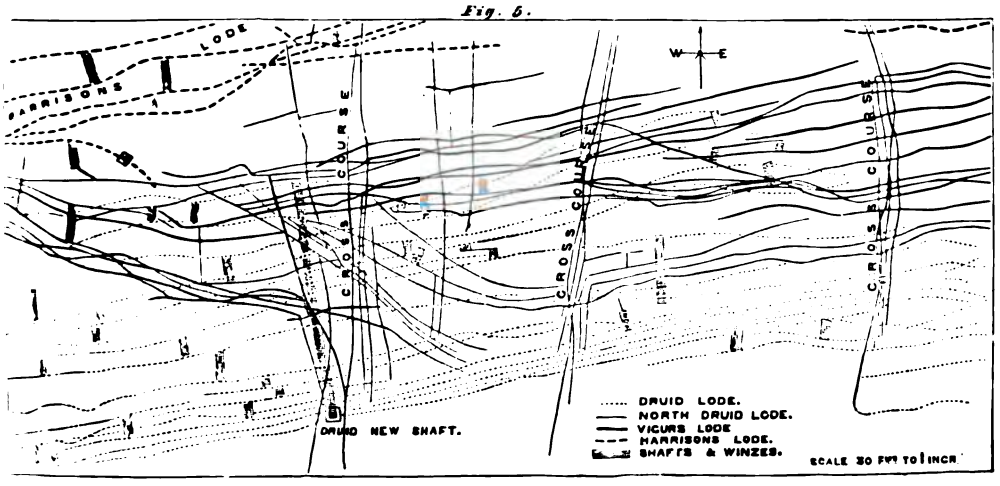
1. Section through the Forest of Dean Coal Basin. 2. Section of Coal Strata and Shafts, showing Pumps, &c. 3. Hewer at work in the Thick Seam, South Staffordshire. 4. The Davy Safety Lamp and Group of Coal-mining Implements. 5. Section across the Somerset Coal Field, showing Faults or Troubles.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.



1. Section of part of Devon Great Consols Copper Mine. 2. Cross Section of Hot Lode, United Mines. 3. The Cornish Miners. 4. Typical Section across a Mineral Vein or Lode. 5. Plan of part of the Workings in Carn Brea Mines, Cornwall.

excavated polygonal chambers were discovered in a 6-feet bed of coal; underground chambers, similarly shaped, were also found at the Alderly Edge Mines in Cheshire. As these chambers are widely different in their shape and dimensions from anything of the kind known at the present day, and seeing that there is something in their symmetrical arrangement peculiarly Roman, there is presumptive evidence that they are the works of Roman miners. Coal having been found amidst the ruins of Uriconium, proves their acquaintance with that fuel.

Nothing very certain is known of the history of coal-mining in Britain before the year 1259, the date of the memorable charter granted by King Henry III. to the freemen of Newcastle-upon-Tyne for liberty to dig coals. From that time the imports of coal into London seem to have been considerable. About forty years afterwards, an impression that the coal smoke deteriorated the atmosphere became so general among the Londoners as to call for a royal proclamation forbidding the use of the 'noxious fuel.' 'In Petitiones Parliamento, date 1321–22, there is a claim made for 10s. on account of coal which had been ordered by the clerk of the palace, but the payment for which had been neglected.'

George Agricola, born at Chemnitz, in Germany, 1494, is described as one who 'acquired a large amount of practical knowledge by visiting the mines, studying the processes, and making himself completely master of their details.' His work De re Metallica, consisting of twelve books, shows that mining was systematically and vigorously pursued in his day. We are therefore quite safe in considering mining to have been made an important branch of engineering as early as the fifteenth century.

In the reign of Henry VII. (1485) a commission was appointed with 'liberty to dig and search for metals, except under the houses and castles of the king and his subjects.' Several grants and charters were made in the subsequent reigns, but it was not until the time of Elizabeth that any very active measures were taken to encourage the search for useful minerals. That queen induced German miners to visit England, and she granted them extensive privileges—no person being allowed to dig or search for minerals without their license. The 'Society of Mines Royal' was established in the tenth year of Elizabeth's reign; and also another corporation, 'The Society for the Mineral and Battery Works.' In 1670 Prince Rupert granted 'Articles of agreement and subscription' to 'undertakers' of sundry mines in Wales; and from this period British mining has continued steadily to progress, subject only to those alternations which attend all commercial transactions.

In 1881 there were in active operation in Great Britain the following number of mines:—

Coal Mines	3813
Iron Mines (not including ironstone mines in the coal-measures)	284
Tin Mines	95
Copper Mines	68
Lead Mines	250
Zinc Mines	50

The iron ore produced from the stratified beds of the coal-measures, and worked with the coal, is included in the above coal-mines. Pyrites, zinc, and other minerals are often produced from the mines worked for copper and lead ores. From these mines we obtained in 1881:—Coal, 154,184,300 tons; iron ore, 17,446,065 tons; copper ore, 52,556 tons; tin ore, 12,898 tons; lead ore, 64,702 tons; zinc ore, 35,527 tons; iron pyrites, 43,616 tons; manganese, 2884 tons; salt, 2,298,220 tons; with sundry other minerals; the total value of the whole amounted to £76,201,695. The total value of the metals produced from these ores and of coal and other earthy minerals raised in 1881 was £90,860,487.

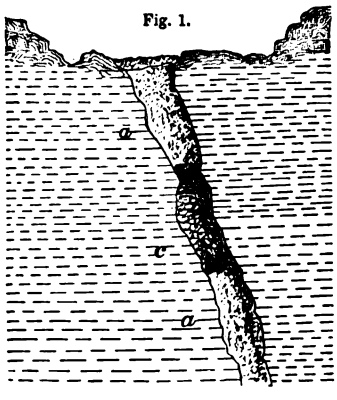
The metalliferous minerals generally occur in *lodes* or *veins*. These are fissures or cracks which have been produced in the rocks—evidently by some convulsive action—extending with a wave-like motion over large districts. Hence we find that there is a general uniform line of direction for mineral veins; those of tin and copper in Cornwall and Devonshire running from the north of east to the south of west, while, in the same counties, the lead lodes usually run north and south. These directions vary in other districts, but are tolerably constant for each locality. It appears that the direction of the fissure has some relation to the metalliferous value of the lode itself. Some lodes are nearly perpendicular to the horizon, but most of them have a considerable inclination, or *hade*, as it is termed, the angles of dip being various. It should be clearly understood that the evidence is nearly complete, showing that those veins or mineral lodes have been gradually filled in by deposits from water, either hot or cold, flowing through them—in some cases from below to the surface, in others from the surface downwards. On Pl. CXXVI.-CXXVII. is shown what we may call a typical mineral lode, in which similar deposits have taken place simultaneously on either side of the fissure. The letters, which are repeated on either side of the drawing, show how pyrites, copper, blende quartz, and fluor spar are regularly deposited on each side of the lode at the same time. The causes of these alternations are due to some well-defined law, but with the causes in operation we are imperfectly acquainted. The plate also shows a vertical section across a set of those lodes, and the mode of sinking upon them. The depth to which lodes extend is not known; the deepest working upon a copper lode, in this country, was carried to the depth of 320 fathoms, or 1920 feet below the sea level, at Tresavean. The deepest tin mine now at work is Dolcoath, in Cornwall, which is about 300 fathoms below the sea level. There is a point of considerable interest connected with the lode at this mine, and others in the mining district of Redruth and Camborne. The mine was commenced, and worked for perhaps 100 years or more, as a tin mine. It was then about to be abandoned because they came to the 'yellows.' This was an ore of copper, which was subsequently found to be very valuable, and Dolcoath was worked as a copper mine until within the last twenty years, when the copper failing, the water was allowed to rise in the mine, the upper levels only being worked. Eventually the shareholders were persuaded again to pump all the water from the bottoms of the mine, and boldly to penetrate to a greater depth. The result was that the lode was discovered to be, below the copper ore, exceedingly rich in tin; and Dolcoath is now the most important tin mine in the world. This very remarkable alternation of tin (*a*), copper (*b*), and again tin (*a*), as shown in Fig. 1, is one of those remarkable phenomena the explanation of which we have still to seek.

The conditions of temperature in some of our mineral lodes are also remarkable. In the deep mines of Cornwall the increase of heat is found to observe, in relation to depth, a diminishing ratio. Between the line of mean equal annual temperature and the first 100 fathoms the increase is 1° for every 50 feet of depth; in the next 100 fathoms it is 1° in every 70 feet; and down to 300 fathoms it is about 1° in every 85 feet.

The section of the Hot Lode in the United Mines given in the plate is at a depth from the surface of 220 fathoms, and here there is a remarkable intersection of lodes, and some curious 'Elvan' courses (a peculiar porphyritic rock) which have been forced

through the superincumbent strata. At this point a large quantity of water, at a temperature of 124° Fahr., comes up, which is exceedingly rich in lithium,

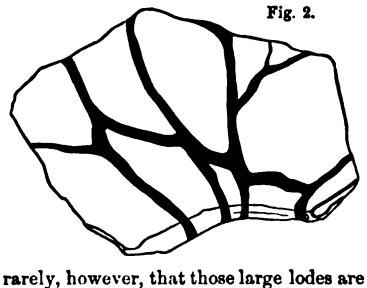
Fig. 1.



the air in the adjoining levels being 120° Fahr. Such were the difficulties of mining at this temperature that the miners could only work twenty minutes at a time, and then rushing out of the level they would plunge into water at 90° Fahr. to cool themselves. A similar lode has more recently presented itself at Wheal Seaton, near Camborne. There is another set of phenomena which must not be lost sight of. These are the currents of electricity which are found to be constantly circulating in the mineral lodes. These electric currents have been made the subjects of very careful observation by Mr. Robert Were Fox, F.R.S., and from having produced electrotype deposits by means of the electricity derived from the mineral veins, Mr. Fox came to the conclusion that electricity was the active agent in producing such deposits as are shown in the typical lode represented in the plate. The subsequent investigations by Mr. Robert Hunt and Mr. John Arthur Phillips, appear to prove that the electric currents detected are due to chemical action going on within the lode itself.

Metalliferous veins vary much in size. They are sometimes mere strings running very irregularly through the rocks, as shown in Fig. 2. They often spread out until they have a width of many feet. It

Fig. 2.

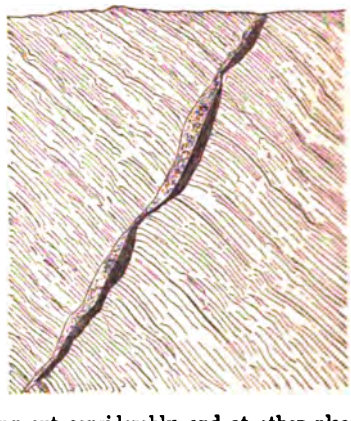


is but rarely, however, that those large lodes are filled in with metalliferous minerals. Earthy minerals not uncommonly occupy the largest portion of the lode, while the metallic ores are irregularly dispersed through it. In Fig. 3, *a*, *b* is a cross-section of a copper lode; *c*, *c*, *c*, is chiefly quartz; *d*, *d*, *d*, being masses of the sulphide of copper and iron (yellow copper ore) dispersed through it. These metalliferous fissures vary considerably in their length; sometimes the same lode can be traced for miles, but it often happens that the vein runs but a short distance through the rock. The depths to which our mineral veins extend is unknown. The bottoms of some of them have certainly been reached, but at the greatest depth to which man has yet penetrated into the earth, many lodes are rich with metal, and show no signs of diminish-

Fig. 3.

ing in size. These lodes are subject to much irregularity in their width, as shown in Fig. 4, often

Fig. 4.



swelling out considerably, and at other places contracting to a mere line.

There are also deposits of metalliferous minerals in *beds* or *layers*, sometimes horizontal, but often variously inclined to the horizontal plane; and as already stated in MINE, we frequently find the metallic ores in isolated masses, called by the miners 'bunches.'

METALLIFEROUS MINING.—*Searching for Minerals.*—The first steps to be taken by the miner in an unexplored mineral field are to ascertain the geological age and character of the rocks thereof, and having satisfied himself on this point he is then in a position to form an opinion as to the class of minerals most likely to be met with. When the surface rocks of a country, or any district of a country, are chiefly granites overlaid and associated in places with schistose rocks, then metalliferous lodes may be expected, bearing tin, copper, lead, &c. In the lower members of the Silurian system copper, lead, and gold are sometimes found. The limestones of the Carboniferous system bear lead, zinc, and sometimes copper and iron ore. The intelligent mining engineer is enabled to judge of the mineralogical character of a district of country by surface inspection, or by viewing the landscape contour—general sterility in vegetation, and abrupt and rugged surface irregularities, indicating the oldest rock formations; broken mountain ridges, with their concomitant glens, steep and

boldly outstanding cliffs, are features presented by the metamorphic rocks, and by the older Silurians; and deep river gorges, with wider slopes—and gentler escarpments, presented by hills often clad with trees, and the valleys thereof luxuriant in vegetation, may be examined as probably productive of some variety of mineral treasure. For a minuter inspection, however, it is necessary to resort to valleys, ravines, or river gorges, which in some cases have been denuded or worn out of the strata by river currents, or by inundating sea waves; while in others, as in the gorge of the Bristol river, Avon, a large opening of the rocks has been effected by a powerful upheaving force. When large sections of the crust of the earth are exposed, the miner sees at once the mineral lodes which the rocks contain, or, at any rate, ascertains the geological age and lithological character of the exposed strata. An examination of the material deposited on the banks and in the beds of streams—which either are or have been in existence—often leads to the discovery of minerals in the district through which the stream passes, as the continuous action of a current of water in operation for long periods of time denudes and eventually breaks up and carries away fragments of the minerals from their natural position in the rocks, and deposits them in places where the transporting power of the current becomes less than the resistance offered by the specific gravity of the mineral. The miner often follows up the beds of rivers in search of '*shode*' stones. Those are fragments broken from the primitive lode; the masses of ore becoming larger and larger as the lode is approached. The surface indications of metalliferous lodes are various: the true mineral-bearing character of a lode being but rarely continued to the surface. Often the vein is covered by a kind of rotten matrix, in which several minerals are sometimes found, such as the sulphides and carbonates of copper, soft ferruginous earth, and carbonates of lead. This covering of a lode is called the *gossan*, and the irregular conglomerated mass is termed the *broyl* (bryle) of a lode. It is believed by many miners and others in Cornwall and Devonshire, that some of the principal mines of these counties have been found by what is termed the *vulgus divinatoria*, the 'divining-rod,' vulgarly called 'dowsing-rod.' This consists of a forked hazel twig or black-thorn; the smaller ends are held, one in each hand of the operator, who, placing the hand in a very constrained position, inclines the rods to the horizon at an angle of about 70°. Walking in this manner in a direction at right angles to the prevailing direction of the lodes of the district, as soon as he reaches the position directly below which the minerals occur, the *dowsing-rod* or *divining-rod* is supposed to be forcibly drawn down to the perpendicular. The divining-rod was introduced into this country by the German miners in the reign of Elizabeth. It may safely now be relegated to those pseudo-sciences which are represented by table-turning and the like.

A system of searching for mineral lodes, which is called *costeaning*, has been for centuries adopted in Cornwall. It consists in sinking long but shallow pits across the line of general direction of the veins. As the deposits of tin and copper generally run from east to west, any such pits sunk along a line from north to south must cut them if they exist. In a similar way it sometimes happens that deep ploughing discloses a mineral lode.

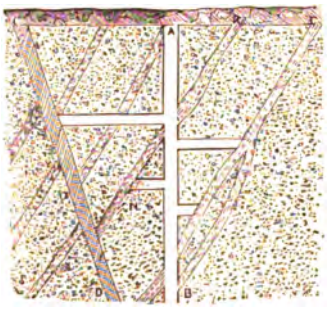
The section of a portion of Devon Great Consols will convey a good general idea of the character of a copper mine (see plate). It shows two shafts sunk from the surface, one of which is used for the pumping machinery, while through the other the material is drawn to the surface. The levels driven upon the lode are also shown, and the productive ground removed is indicated by the dotted portions. Two slides or movements of the mass of rock, which were met with in working, are depicted, as well as two 'cross courses,' which may be popularly described as fissure-veins running in contrary directions to the rich metalliferous lode itself. The horizontal galleries, seen in the section, are driven along the course of the lode at about 10 fathoms apart, and the vertical passages or 'winzes' uniting the horizontal ones are made at distances from each other varying according to the richness of the lode, or to the number of miners which the manager aims at preparing places of work for. All the spaces shaded represent portions of the mineral vein which have been sufficiently rich for removal. It will be seen that in this way the mine, or rather the lode, is divided into a number of rectangular blocks, each of which is called by Cornish miners 'a pitch.'

The plan of Carn Brea Mine (last fig. on plate) is intended to represent the lodes upon which workings are carried out, the different lodes being distinctly marked. This plan has been selected to show a remarkable example of the irregularities which are often found in our mineral deposits in the older rocks. It will be noticed that each set of workings on the different lodes have dissimilar directions, sometimes crossing each other. It may be necessary to inform the uninitiated reader that if the earth were transparent, and he looked down into it, he would see the several levels driven upon the lode exactly as they are represented here. The cross section of the Hot Lode, already referred to, shows the underlie of the lode and the manner in which the levels are driven from the shaft to intersect the lode. The sinking of shafts and driving of levels is called 'tutwork,' and is contracted for by the miners at so much per fathom. Working out the pitch is named 'tribute-work,' and is 'bargained' for at so much per pound sterling on the value of ore raised; 6*d.* or 1*s.* per pound would be given for the richest kind of ore, and from this price up to 13*s.* per pound where the lode is uncertain or very poor. On many occasions small fortunes have been made by the 'tributers,' from a 'pitch' which has been taken at a high tribute turning out very productive. There are two general methods of working out the pitch, namely, by 'underhand stoping' and by 'overhand stoping.' The ore broken by the tributers is filled into barrows, wheeled along plankways to the shaft, and drawn to the surface by means of a chain, or now more commonly by a wire-rope, either in an iron 'kibble' or in a 'skip'—a rectangular wooden box on wheels, travelling in guides fixed to the sides of the shaft.—The means of access to most metalliferous mines is by ladders fixed in the shafts, sometimes inclined, but in many cases perpendicular. The excessive labour attending the ascent of mines by this means is a severe tax on the strength of the miner in the deep mines, entailing disease and premature age on him, and consequently loss to the mine proprietor. The prejudices of the tin and copper miner will not yet allow of the introduction of cages travelling in guides, such as are used in the coal mines. The toilsome climbing of 1500 feet or more on nearly vertical ladders is therefore continued in by far the larger number of the mines of Western England. At Minera Mine in Denbighshire, and some others in the lead-mining districts, the miners go down and up the shaft in cages with great safety, care being taken that the ropes employed are in good condition. In a large number of the lead mines ingress and egress is through the adit or day level. About 1843 the Polytechnic Society of Cornwall offered a reward of £500 to the mine which first adopted some more approved method of descending

into and ascending from the deep mines. Tresavean secured the reward by putting in a 'man-engine.' The man-engine consists of one or sometimes of two rods, reaching from the surface to the bottom of the mine; they are connected to a steam-engine at the surface by means of cranks, and worked similarly to pump-rods (see the plate); standing places, or small platforms, are fixed to rods 12 feet apart, and hand-holds a few feet above them. The rods are moved by 12-feet strokes, and a man in descending passes from the platform on which he stands on to the fixed platform in the side of the shaft just when the direction of motion changes. The engine at this time is passing the 'dead points,' and time is thereby given to step from one platform to the other; this is repeated until the bottom of the shaft is arrived at; and by taking the up-stroke from the bottom, the ascent is made in a similar manner. Not more than six or seven mines in Britain have as yet adopted this machine, nor is it likely to come into general use, owing to its cost.

Sinking for Metalliferous Ores.—The site of a shaft or a vertical sinking is easily decided upon in most places where a metalliferous lode is to be worked, as in many cases the course of the sinking is on the inclination of the lode. Where this happens the cost of shaft sinking is so trifling that shafts can be put down on the lode in a great many places. The principal working-shaft, however, should be in a place somewhat central for the working of the minerals; and, moreover, regard must be had to the suitability of the place for surface machinery. Engines for pumping water from the mine and for raising the ore as well, can sometimes be worked very cheaply and safely by water-power; and if this can be taken advantage of in some place upon the line of the mineral vein to be worked, it is well to decide upon the position of the shaft with reference to the water-fall which may be obtained. Fig. 5 shows the general character of inclination of mineral lodes and the system of sinking a shaft upon them and driving levels to intersect them. The shaft A shown in Fig. 5 is a vertical one, cutting the lodes B C, &c., in its descent; and from the shaft lateral galleries are driven right and left, intersecting the lodes within their range. These shafts being mostly

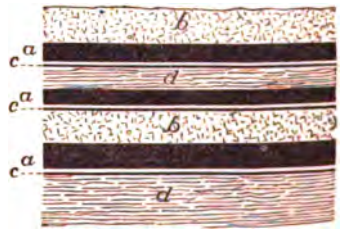
Fig. 5.



sunk through hard granite or clay slate (*Killas*) for tin and copper require considerable outlay of capital. To hasten their progress they are sometimes commenced at one or two places in the same vertical plane below the surface; this of course can only be accomplished when an 'adit-level' can be driven into the place of the shaft from a valley near to the sinking operation. Adit-levels are galleries driven from the valley into a hill so as to cut the lode at the lowest possible level. They are used for the purpose of discharging the waters which drain from the surface or which are pumped from below, thus saving the cost of lifting the water to a higher level. The 'adit'—called generally a 'day-level' in the lead-mining districts—is also used for the purpose of removing the ore from the mine. From the United Mines, Gwennap, in Cornwall, an adit-level was constructed for their drainage 30 miles in length, and this effected a saving for coals alone used in the pumping-engines of about £19,000 per annum. Subsequent to the formation of mineral lodes, or contemporaneous with them, elvan courses (dykes of trap or whinstone) have been formed, and these in some instances have an underlie or dip almost directly opposite to that of the lodes. C' D in Fig. 5 shows a very common position of an elvan dyke as related to the position of the lodes. The lode S is shown fallen away from its original place at O, and so on with all the other lodes intersected by the dyke. There is a law of faults by which the miner is guided in searching for mineral of any kind on the opposite side of a fault—namely, if the floor or lower wall of a lode makes an obtuse angle with the fault, then the mineral on the opposite side will be in an upward position; but if this angle be an acute one the mineral must be sought for in a downward direction. When driving on a lode in level course a dyke may be met with, or a 'fault' may occur; if by this the lode is moved from its original position in a direction to the right hand of the miner it is then called a *right-hand heave;* when on the contrary it is called a *left-hand heave.* The former is when the left-hand wall forms an obtuse angle with the fault, and the latter when this angle is an acute one. On the lode C B of Fig. 5 is shown a *horse* or division of the lode into two portions for a short distance of its course. The side galleries from the shaft intersecting the lodes are shown as at N.

Coal-mining.—Coal is always deposited in beds, often very nearly horizontal, but not unfrequently, by movements of the earth's surface, these have been made to take a position more or less vertical. Fig. 6 represents three seams of coal (*a a a*) of different thicknesses, with their associated beds of 'underclay' (*c c c*). These beds represent, in all probability, the soil upon which the plants grew from which the coal has been derived. These 'seams'—beds of coal—are interstratified with *b b*, layers of sandstone, and *d d*, beds of coal-measure shale between them; while Fig. 7 shows a set of similar beds which have been shifted to a nearly vertical position. When such movements of

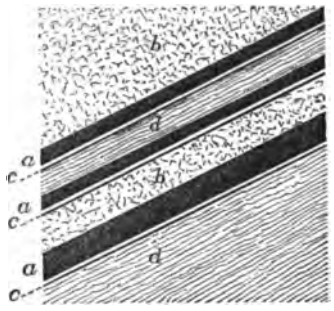
Fig. 6.



large portions of the earth's surface take place there must naturally be great cracks formed along the line of least resistance, by which the beds will be broken or *faulted*, those 'faults' frequently shifting the beds very considerably. The way in which beds of coal are frequently exposed by the sides of valleys is shown by Fig. 8. The places where the strata are broken off, as shown in this figure, also where they rise up to the surface owing to their inclined position, even where no such valleys exist, are called the 'outcrop,' and their edges are spoken of as

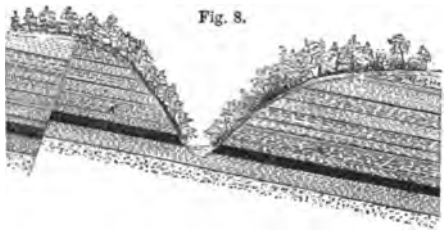
'basset edges.' The plough of the agriculturist in passing over the outcrop of coal has sometimes led to the discovery of this valuable fuel.

Fig. 7.



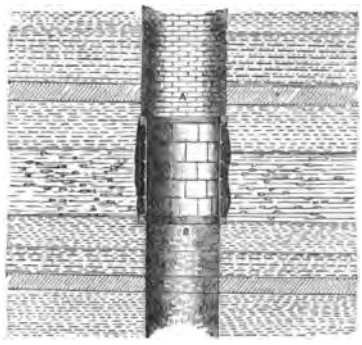
From what has already been said it is apparent that coal-seams at the 'outcrop, or places where they rise up to the surface, are opened up into a work-

Fig. 8.



able condition at very little expense; hence, in places where the 'outcrop' is met with, or where the coal comes within a few feet of the surface, it is approached by 'day-levels,' or what are called in some mining localities 'ingoing eyes.' But in the principal coal-fields of Britain the most of the outcrop coal has been exhausted, so that deeper sinkings are required, and mining is therefore becoming year by year more perilous, and incurring a much larger outlay of capital. The shafts or pits sunk for the purpose of reaching the coal may be considered as divided into three classes, owing to the difference in shape of their horizontal sections, namely, rectangular, circular, and oval. The rectangular shape prevails in in Scotland, and is one that admits of some facilities in supporting the sides by timbering. Three-inch planks are laid one upon another in parts of the shaft where the rock is too loose and broken to support itself, and these are fastened by the ends and sides, planks being used alternately as stays to each other; also by stays and partition-walls in one or two places in the length of the rectangle: 18 feet by 6 feet is a size commonly adopted. The circular shaft is almost the only shape seen for the large collieries of Northumberland and Durham. When water is met with issuing from the strata in considerable quantities, a means of damming it back is adopted. One way of doing this is by what the sinkers call 'plank-tubbing,' and consists of circular frames of timber of about 5 inches square placed about 3 feet apart; against the circular frames, or 'cribs,' 3-inch planks, bevelled to the circular on the edges, are spiked, and their joints tightly wedged. Another method is by blocks of wood cut into the shape of circular walling-stones, and after being built into the shaft they are wedged at the joints and in the solid portions of each block, as long as ever the wedges can be made to enter. In the Belgian collieries these blocks, instead of being cut to the circle, are used in straight pieces, so where the tubbing is built in the shaft the shape thereof is polygonal. Brick walls 9 or 14 inches in the bed, backed with about 18 or 20 inches of hydraulic lime concrete, answers the same purpose for pressures of water not exceeding about 30 or 40 lbs. per square inch; but where high pressures are to be resisted a tubbing of cast-iron segments is frequently employed. Each segment is 2 feet deep and from 3 feet to 6 feet in length, and the thickness of the shell proportioned to the pressure of water and the diameter of the pit; they are united by flanges about 3 inches broad, which are generally placed outwards from the centre of the shaft, and the joints are all sheathed or lined with ½-inch deal, so as to be made water-tight by wedging. An inspection of Fig. 9 will give a general notion of the walling and tubbing of shafts. The

Fig. 9.



tubbing A B is seen here in a part of the shaft at some distance from the surface. In this position it must be made thoroughly waterproof at both the top and bottom, as well as at the joints. The rectangular shaft before noticed is but ill adapted for these modes of damming back water, and is in all most important points inferior to the circular one. The oval-shaped pit has but little to recommend it, and is rarely constructed.

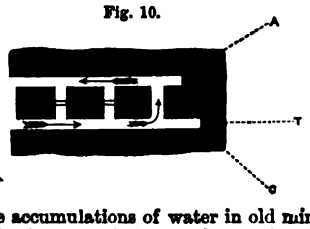
Boring.—In searching for coal-beds, or ironstone bands associated with coal, and interstratified with the clay shale of the coal-measures, it is advisable to *bore* through the strata in order to make sure work of the more expensive process of sinking a large pit. Boring is consequently a very important branch of mining. In ordinary practice a well is first sunk of such a depth that the boring apparatus can be fixed in it. The boring plant required consists of the shear-legs, the windlass, the brake, the brace-head, the bore-rods, cutting-tools, keys, sludger, bechè, and specimen borer. The bore-hole is usually commenced by digging a small pit about 6 feet deep, and over this is set up the three legs, with pulley, &c. The boring-rods are from 10 to 20 feet in length. The chisel is first inserted, and the rod placed in the hole. A lever is employed to raise the bore-rods, and an experienced borer stationed at the opposite end of the lever gives a slight twisting motion to the rods by means of a brace-head or handle attached to the top of the rods; the men let go their hold, and the rock at the bottom of the hole is broken by the percussion of the chisel or cutting-tool. This is regularly repeated until the triturated rock at the bottom of the hole interferes with the action of the chisel; the rods are then drawn to the surface by means of the rope and windlass; the cutting-tool is replaced by the sludger or cleaner,—a cylindrical instrument of 5 or 6 feet in length, open at the bottom, and provided there with a small

internal disk or valve opening upwards. When the rods are again let into the hole, and alternately raised and depressed a few times, the broken rock passes into the interior of the sludger, and is kept there by the valve until the rods are again extracted. An opening at the top of the sludger enables the borer to easily clear it of its contents. The bore-rods are jointed together by box and screw; the keys are used for the purpose of screwing and unscrewing the rods; the brake is the name given by borers to the lever; the bechè is an instrument shaped in the interior like a cone, and is used for recovering the rods when they break in the hole. What are called right and left handed screws are useful for the same purpose; they are shaped like cork-screws, the spiral interior cone being larger at the bottom than the diameter of the bore-rods. The specimen-borer is a cylindrical cutting-tool, by means of which a core of mineral may be obtained from the bore-hole. Men experienced in the art are able to judge with accuracy of the kind of mineral or rock through which the cutting-tool may be passing at any time, simply by the impression on their hands, produced by the jerk of the rods when holding the brace-head. When borings are required to any considerable depth, and where speed is of importance, steam-power is employed. Several steam-engines especially adapted for boring have been devised. Mr. Hunter of Coltness, near Glasgow, patented a small portable steam-engine, by means of which the process is very much facilitated, and the boring effected with much more expedition and despatch than can be attained by the ordinary method. A similar invention has been very successfully applied by Mr. Patton of the Govan Collieries, Glasgow, for proving the existence and thickness of ironstone deposits and coal-seams in mining localities. By both of these inventions the rods used in boring are raised through a cam on the driving-shaft of a steam-engine, coming in contact successively with the end of an ordinary lever; or the steam-engine in these cases takes the place of the men. The rods are drawn from the hole by a wire rope coiling on a small drum of the engine, and instead of inserting the rods with the sludger as before, the wire rope answers the purpose of the rods. The method of boring with hollow rods, combined with a force-pump, was introduced by M. Fauvelle in 1846. This system of boring is probably the most simple. The boring-rods consist of ordinary steam-tubing, 2 inches diameter, and jointed together by union boxes. The chisels are welded into short lengths of tubing, small holes being left at the bottom of the tube. Water is forced into the top of the bore-rods by means of a small force-pump. This passing under pressure through the rods, escapes at the bottom, and is impelled up the bore-hole and to the surface, carrying with it all the *débris* cut up by the chisel.

MM. Kind and Chaudron have been the most successful boring engineers. Their engine is called the *roue à marche*, and consists of the following parts, viz.: a wheel of about 12 feet in diameter, and sufficiently broad for five or six men to stand abreast in the interior; a smaller wheel is connected with this by means of four rollers placed at equal distances apart on the rim of the smaller wheel; the bore-rods are attached to a lever, and as the men in the inside of the *roue à marche*, or wheel of walking, step together all in the same direction, the rollers one after another raise the end of the lever, and with it the bore-rods. A spring-board is employed by which the fall of the rods is somewhat broken or modified, and their liability to break in the hole somewhat lessened. Mons. Kind's free-falling tool is a useful instrument, and well qualified to lessen both risk and expense. These levers are joined to the leather iron-bound disc by a small rod, and the lower ends of the levers are moved together by a depression of the disc, and moved asunder by a slight elevation of it. There must be water in the hole to insure the action of this instrument, and the disc, which has a movement independent of the rods, is elevated and depressed by the resistance of the water. The rods are simply to raise the cutting tool, and when the back motion is given to the rods the cutting tool is liberated by the water raising the disc, and the rock is cut by the weight of the cutting tool alone, by which a core of rock is perforated. After this core has been prepared for the depth of 1 foot or 18 inches the cutting tool is withdrawn, and a cylinder with several teeth, which work on a hinge, is raised against the interior of the cylinder when the core is reached. A second and smaller set of rods are fixed to the inner cylinder, and by means of this the teeth are pressed downwards as the main rods are turned about in the hole. In this manner a groove is cut at the bottom of the core, which, by jerking the rods, is then easily broken off, and is brought to the surface to be examined. Some very deep borings have been made by Kind in the neighbourhood of Paris and in other places in France for artesian wells. One of the borings near Paris is about 3 feet in diameter, and the same engineer has invented a large tool, by means of which pits 12 feet in diameter may be bored. In China ropes have been always used instead of rods for working the boring tools. This method has been most successfully carried out in America in sinking for petroleum; and in Great Britain, with some most ingenious modifications, it has been adopted by Messrs Mather & Platt. The Diamond Boring Machine, which is now attracting much attention, was invented by M. Leschot, a Swiss engineer. In this the cutting tool is of a tubular form, and receives a uniform rotatory motion, the result being the production of a cylindrical core from the rock of the same size as the inner periphery of the tube. The boring bit is a steel thimble, about 4 inches in length, having two rows of Brazilian black diamonds firmly imbedded therein, the edges projecting slightly from the outer and inner periphery of the tool. The diamonds are placed about one-third of an inch apart. These diamond teeth are the only parts which come in contact with the rock, and their hardness is such that more than 2000 feet have been drilled by the same diamonds with but little appreciable wear. This machine has been greatly improved by Messrs. Appleby and Major Beaumont. The Diamond Boring Company, of which the latter gentleman is the managing director, has undertaken and successfully carried out some very deep borings. The cost of boring by hand is usually 1*s.* per foot for the first 30 feet; 2*s.* for the second 30; and so on, adding 1*s.* a foot for every additional 30 feet. For deep boring by steam-power the cost is about 13*s.* a foot for the first 100 feet, and about 7*s.* a foot is added for each additional 100 feet. It is doubtless quite practicable to apply machinery to mining operations to a much greater extent than has been hitherto done, and instead of the laborious process of pit sinking or of hewing either stone or coal, machinery propelled by steam, water, or air, will, in a few more years, no doubt be almost universally applied to such purposes. By Fig. 10 is shown the direction in which borings are required to be made from the ends of exploring passages in mines, when approaching old wastes full of water; the dotted lines, A T and C, indicating borings by means of which the coal situated to the right and left of the passages would be proved, as also the coal lying directly ahead of the end of the passages. Any dangerous accumulations of water or gas met with in

the range of these bore holes could be let off gradually, instead of being allowed to rush in upon the workmen in such quantities as to endanger life; and, indeed,

Fig. 10.



where large accumulations of water in old mines are holed into by borings of this kind a small plug inserted into the end of the boring may be sufficient to keep back the water until strong dams of wood can be built into the narrowest and strongest places of the exploring passages; the water by this means may be effectually kept out of the mine, all the expense of raising it to the surface saved, and in many cases the entire loss of the mine and the lives of the workmen prevented. The length which these borings require to be carried in advance of the working face depends upon the probable pressure of water in the old workings. From 8 to 15 yards is generally considered sufficient in coal, but as many feet may be quite safe in hard stone.

In sinking a shaft the rock, usually sandstone or shale, has to be blasted. There is much danger connected with blasting the rock in the bottom of a sinking shaft. The safety-fuse is now invariably used to ignite the powder instead of the straw formerly employed by the miner. The safety-fuse is a twisted cord, hollow throughout, the hollow being filled in with powder, one end is placed in the charge of powder at the bottom of the hole, and the other reaches a little above the top of the hole. The tamping, which is made with sand or the debris of the rock produced in boring, is effected with the safety-fuse in the hole. The fuse is lighted, and the men retire to a place of safety, before the hole is fired. In a few instances blasting by electricity has been used, but the practice has not been generally adopted.

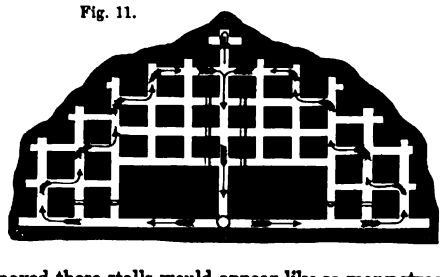
Sinking through running sands is an operation of considerable difficulty and expense, and the process requires great care on the part of the engineer, as the great pressure of the quicksands is calculated to break away against almost the strongest means of support that engineering skill can devise. Where the sand is not more than a few feet in depth a passage through it may be accomplished by a system of piles, each pile being a spar of timber 7 or 8 inches square, and from 8 to 10 feet in length, shod with pointed iron at one end to facilitate its passage through the sand, and hooped with a strong iron ring at the other, to prevent its splintering from the blows of the pile-driver. These are driven into the sand in close contact with each other, so as to form a circle somewhat larger that what is intended for the finished diameter of the pit. The sand is lifted from the inside of this cylindrical work of piles, and circular frames of timber inserted to keep the piles in their places. After the bottom of the first set is reached a second lot of piles is driven in the interior of the former, and so on until the sand is passed through. Another method of overcoming the difficulties of quicksands is by sinking cylinders of cast-iron segments, similar in construction to the cast-iron tubbing already noticed, but having the flanges towards the centre of the shaft, so that a smooth surface may be presented to the sand. These are sunk, one within another, in telescope manner, until the hard rock is reached below the running sand. Some very difficult sinkings have been successfully executed in Germany, through sands and moving ground, by Mr. Coulson, an eminent sinker of Newcastle-upon-Tyne. At the Morton Colliery, county of Durham, large beds of quicksands were met with, and necessarily added much to the large outlay of capital for the sinking. For a detailed account of the engineering of this undertaking the reader is referred to the Transactions of Newcastle-upon-Tyne Institute of Mining Engineers. Similar difficulties have been met with in the sinking of shafts in various other places.

Modes of Working out the Coal.—The coal having been reached, it is now necessary to devise the most economical and the safest method of cutting out the coal and sending it to the surface. The first figure on the plate, a section of a portion of the coal basin of the Forest of Dean, will show the manner in which the beds of coal lie, and it will be easy for the reader to see how shafts must be sunk, and ways, galleries, or levels must be driven on the course of the bed.

One shaft not unfrequently intersects half a dozen seams of workable coal, and many more, too thin, or of too inferior quality of coal, to be profitably excavated. These seams are generally separated by fathoms of coal shale, beds of sandstone, bands of ironstone, and in some instances of limestone. The section across the Somerset coal-field shows those alternations of the strata, and is a curious example of the frequent occurrence of dislocations or *faults* or '*troubles*.' There is perhaps no bed of coal of uniform texture, and in which there is an entire absence of partings, or separating planes, parallel to the plane of bedding, exceeding about 4 feet in thickness; such beds are generally not more than from 2 to 3 feet in thickness, but several of them are often found together, forming one large seam. In this way seams of coal vary in thickness, from an inch or two up to 30 feet, as in the Staffordshire thick coal; or even to 90 feet, as in a small coal area at Johnstone, near Glasgow. The coal seam 30 feet thick in one part of Staffordshire is proved by Mr. Beete Jukes to be split up into several thinner seams, each separated from the other by a few feet of intervening coal shales, in another part of the same coal-field. Some idea of the workings upon the thick coal will be formed from the third figure in the plate.

There are two general methods or systems of working out coal seams, namely, 'the pillar and stall,' or 'stoop and room system,' and the 'longwall' or 'longwork' system. The former system is shown by Fig. 11, and consists in driving passages, named by miners 'stalls' or 'rooms,' in such a manner as to divide the coal into rectangular pillars or 'stoops.' If the massive covering of a coal mine could be re-

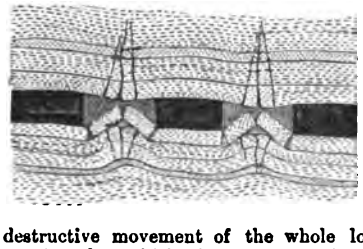
Fig. 11.



moved these stalls would appear like so many streets intersecting each other at right angles, and the pillars would resemble blocks of building between the streets. The air in these intersecting passages soon becomes deteriorated by the breathing of the miners, and the burning of the lights, necessary for working in these dark recesses. On this account some method must

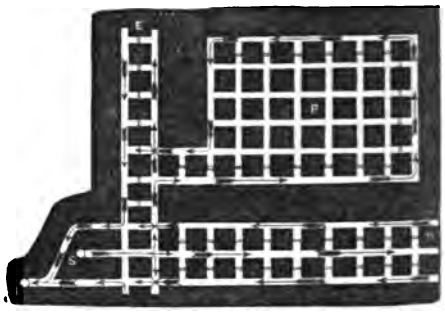
always be adopted to keep the air circulating with sufficient rapidity to maintain it in a healthful condition. The accumulation of dangerous gases developed from the coal itself is another reason for imperative necessity for securing ample ventilation. In all collieries there are either two shafts, or a shaft divided in two by a *brattice*. One of these shafts, or divisions, forms the *downcast* and the other the *upcast*. The temperature of the colliery being naturally higher than that of the air at the surface, the air in it has a tendency to ascend by the upcast shaft, and, to supply the loss by this upflow, air passes down into the colliery by the other shaft. Thus what is called natural ventilation is established. A shaft is shown at S, and a general notion of the plan of ventilation may be obtained by noticing the small arrows in the figure; it will be seen that these lead in both directions from the downcast portion of the shaft into the ends at E and N, and that these two currents are reunited at R. Supposing the pure air entering a colliery by the downcast, the weight of the descending column being 10,000; to move that, the weight of the corresponding column in the upcast must, by the temperature of the mine, be reduced to 8680, the air expanding by each increment of heat. Now if it contains carbonic acid the weight at the same temperatures will be about 9000, therefore the movement is more sluggish. Hence some artificial aid is required to effect the necessary movement of the air. The coal often holds under pressure large quantities of light carburetted hydrogen gas; this mixing with the air becomes explosive, forming *fire-damp*. Therefore where these explosive gases exist more rapid circulation is required. The subject of artificial ventilation is reserved for a separate section. In the earliest days of coal-mining the great care of the engineer was to make the stalls as large, and the pillars as small, as could safely be accomplished without incurring large falls of the roof of the passages; no attempt being afterwards made to recover the coal in the pillars. This often led to a

Fig. 12.



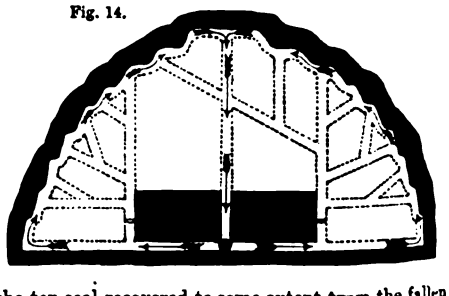
most destructive movement of the whole locality of the mine, by which, in numerous instances, mines have been totally ruined. Where the pavement or floor of the coal seam consisted of soft fire-clay, or contained lime or other carbonates easily decomposed by exposure to a moist atmosphere, the weight of the roof would be communicated through the pillars to the floor, and cause it to swell up in the middle of the passages (see Fig. 12). This movement is technically called 'the creep.' To prevent its effects spreading over a large area in the mine wide barriers of coal are left in places dividing one portion of the workings from another. By leaving these barriers of coal in such a way as to divide the mine into districts or 'pannels' great facilities are afforded for both working and ventilating each district, as if they were separate mines (see Fig. 13). Here the downcast and upcast shafts are separate pits: S is the downcast, and the upcast is near to it in the corner of the figure. The exploring passages may be conceived to be carried to great distances from E and N, and pannels, as P, branching from them every 200 yards or so. The pillars of coal are now in most cases obtained by a second

Fig. 13.



operation; either by working them out after a district or pannel has been driven to its appointed boundary, so that the places out of which all the coal has been excavated, and into which the roof has broken down, may be left behind the workmen; or by working them out immediately the stalls have been driven the length of two or three pillars, and leaving a range of two pillars next the main leading road for its support. The pillars are of various sizes, depending chiefly on the facility with which the stalls can be ventilated for great lengths; about 20 yards square is a moderate-sized pillar, and in one pannel there will be in some cases about 600 such pillars. In working seams of coal exceeding 7 or 8 feet in thickness the bed is frequently commenced with at the bottom 5 or 6 feet; and the coal above that supported as a roof for the stalls, the means of support is then taken away in retiring over the area worked, and

Fig. 14.



the top coal recovered to some extent from the fallen roof.

The system of working by long faces or 'long wall' is shown by Fig. 14. This system of working was formerly confined to thin seams, never being applied to those which exceeded 4 or 5 feet in thickness, but it is now pursued in some places in the thick coal of Staffordshire, and is being gradually extended in Yorkshire and other coal districts. It seems to have been first practised in the collieries of the Shropshire coal-field, and is, on account of its simplicity and the facilities it offers for ventilation, of great practical advantage. The roads, as indicated in the figure, pass through the spaces out of which the coal has been entirely excavated, and these spaces therefore require to be filled up or 'packed' as the working face advances. Putting in the packing and building 'pack walls' by the sides of the roads is a very important feature in this mode of working, and where the roof consists of a tolerably tenacious rock the whole of the roof for many yards

back from the face is found to bend down upon the packing, and in this way affords material assistance to the workmen in the face by breaking down the coal for them. The space out of which all the coal has been taken is called 'the waste,' 'the gob,' or 'the goaf.' A large pillar of coal called 'the shaft pillar,' or 'the shaft stoop,' is in nearly every case left around the bottom of the shaft, for the purpose of supporting the strata through which the shaft has been sunk—a rule for the size of such pillar being that it be a square, the side of which is equal to the depth of the shaft.

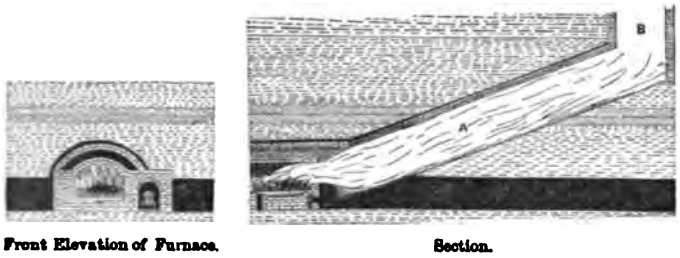
The Ventilation of Mines.—This department of practical mining is one requiring the application of the laws relating to the motion of gases in tubes, and to the effects produced by temperature, moisture, expansion of gases by mechanical means, or compression by mechanical application of force. For the purposes of ventilation there must be a way into the interior of the mine and another way out, technically called the 'intake' and 'return' air passages, and the longer and smaller these passages are the more difficult must it be to maintain a brisk current of air in them. Experience has shown that a current of air equal to *thirty times* the volume of gas yielded by the coal is the bare limit of safety under those conditions. Thirty cubic feet of air must circulate through the mine in the space of time that the coal will give out 1 cubic foot of carburetted hydrogen gas, over and above that which is required to remove the products of respiration and combustion. Now, for safety, considerably more than this is required, and we find the following are the quantities of air circulating in some of the north country and other collieries:—

	Area of Upcast Shaft in Superficial Feet.	Depth of Shaft in Lineal Feet.	Temperature of Upcast.	Temperature of Downcast.	Cubic Feet of Air per Minute.
Hetton	153·	900	211°	43°·5	225,176
Tyne Main	50·25	672	262	44	102,503
Haswell	58·	936	165	62	94,900
Edmond's Main (Yorkshire)	..	..	..	..	86,620
Merryton (Derby)	..	..	..	..	14,720
Cethin (South Wales)	..	..	..	..	20,580

The same details for the last three collieries cannot be given as are given for the first three, but the result will enable the reader to see how variable are the results in different districts. In a non-fiery colliery the circulation of air must be such as to remove, supposing 100 men are employed, with horses, lights, &c., not less than 150 cubic feet of impure air per minute, and nearly as much pure air must be supplied; and for every foot of carburetted hydrogen given out by the coal not less than 50 cubic feet should be added to this to render the working safe.

The ventilation of mines is maintained, as previously stated, either by the natural heat of the mine; by mechanical appliances, as pumps, fans, or pneumatic screws—either forcing air into the downcast shaft or exhausting it from the upcast shaft, by water falling constantly down the downcast, or by ventilating furnaces placed at the bottom of the upcast. Furnace ventilation is considered to be the most efficient and reliable mode of ventilating that has yet been adopted (see Fig. 15). Here B is the upcast shaft and A is the furnace drift. The distance of the furnace from the bottom of the upcast shaft is a point of importance, 30 to 40 yards being a common distance. After the return air from the workings of a mine has passed over the furnace it is then of course greatly elevated in temperature; but it appears that the temperature is not perfectly uniform, as if it then immediately enters a vertical shaft one portion of the air is of higher velocity than another portion, so that an eddying of the air is produced, and the ventilation in some degree retarded. By a long furnace drift the air is made of uniform temperature before entering the vertical shaft; the evil just noticed is thereby prevented, and the ventilation of the mine consequently improved. The drift A should have a rise to the shaft B of about 1 in 6 or 1 in 5. The following are the laws relating to the passage of gases through confined places, which require to be well understood by the mining engineer in carrying out ventilating arrangements in mines, namely:—

Fig. 15.



Front Elevation of Furnace. Section.

1. The velocity of a gas is inversely as the square root of the resistance.

2. The amount of gas passing along tubes of equal length is directly as the transverse sectional area, but inversely as the perimeter.

3. The amount of gas passing along tubes of equal area varies inversely as the square root of their length.

4. The amount of ventilation in mines, where such depends upon the rarefaction of air in the upcast by heat, is as the square root of the difference of temperature of the downcast and upcast shafts.

5. The amount of ventilation is as the square root of the depth of the upcast shafts.

As a general rule no mine should have a ventilating power of less than 50 cubic feet per minute for each man and boy employed in the underground passages, and in mines making large quantities of fire-damp (light carburetted hydrogen mixed with about ten times its volume of atmospheric air) a ventilation equal to from 200 to 600 cubic feet per minute per man should be attained. Explosions of fire-damp are unfortunately of frequent occurrence, and numerous lives have been destroyed at one stroke by this fearful agent. When an explosion takes place the miners in the immediate locality of the explosion become suddenly enveloped in flame, and have been found scorched to cinders; others who escape the flame are dashed to pieces against the sides of the passages by the violent concussion of the air, caused by the sudden expansion of

the exploded gases, or they are poisoned by the carbonic acid, called the 'after-damp,' resulting from rearrangement of elements of the gases during the exploding process. The invention of safety-lamps by Sir H. Davy and George Stephenson was expected to put an end to explosions of gas in coal mines, and prevent the fearful loss of life incurred by them. The safety-lamp is founded upon the principle that although a gas will pass through a wire gauze freely when cold, it will not pass through it when in a state of combustion. The flame in the lamp is surrounded by a cylinder of wire gauze. The explosive mixture of the mine passes freely into the flame and is exploded by it; but the flame is not conveyed to the external mixture of fire-damp. Notwithstanding the value of the lamp as a safe means of lighting in an explosive atmosphere, colliery explosions are still terrible in their frequency and in their extent of havoc of life. (See SAFETY LAMP, and the figure on the plate.) Inspectors of coal mines have been appointed by Her Majesty's government, ten in England and two in Scotland, with twelve assistant inspectors, to thoroughly investigate every case of accident in coal mines, and suggest improvements in the modes of working and ventilating the mines in their respective districts, and although there seems to be a decrease of accidents in some places, and culpable parties are punished by law where accidents have resulted from their carelessness and neglect, there is still a much higher percentage of killed and wounded among the colliers than the amount of risk in their occupation would warrant one to expect. Most of the evil is traceable to carelessness—often amounting to wilfulness—amongst the colliers themselves, the result of ignorance; to bad management, and sometimes to want of skill and experience on the part of colliery engineers. A government system of examination, and granting of certificates to men competent to conduct mining operations with economy and safety, has been adopted, and let us hope the result may prove satisfactory.

Engines used in Mining.—Steam-engines are used for pumping water from the underground workings to the surface: for winding the minerals, workmen, and other material through the shafts; for hauling coal-trucks and other carriages up inclines and along horizontal planes underground; for crushing, stamping, and washing of minerals; for forcing air into mines, both for ventilation and for the purpose of working air-engines in the mine; and for exhausting air from mines, so as to produce ventilating currents in the various subterranean passages. Pumping engines were raised to a higher point of economy and efficiency in connection with the metalliferous mines of Cornwall and Devonshire than had been attained in any other mining locality of the world. This arose from the circumstance that in these counties mines have been worked to an extent, both in depth and in the length of galleries or levels, unequalled by mines of this class in any other mining locality. Coals were much higher in value in these counties than they are in connection with coal-mines; and the engineers for coal-mines have not therefore paid that amount of attention to economy in the use of fuel which characterizes the engineers of Cornish pumping-engines. The high rate of economy in the Cornish engine is attained by working steam expansively; by carefully covering, with felt or other non-conducting heat material, all the boilers, steam-pipes, and steam-cylinders, so as to prevent all loss of power from condensation; by having large boilers, long flues, and slow combustion in the fire-grates; and by good workmanship in the construction of the engines. Unfortunately this cannot now be said of the engines in the mines of Cornwall and Devon. An examination of the published duties of the engines will show a fearful falling off, the result of a carelessness which cannot be too strongly reprobated. The work of the steam is simply to raise the rods, and at the completion of the up-stroke equilibrium valves admit the steam to both sides of the piston, when the rods descend by their own weight. In most cases this weight is in excess of the required pressure for raising the column of water, and part of it is therefore to be counterbalanced by what is called 'the balance bob;' 70 or 80 tons weight of pump-rods is not uncommon. The second fig. on the plate shows all the parts of the pumping arrangements in the shaft:—*f f*, *f f*, force-pumps; *p p*, plungers of do.; *v v*, *v v*, valve-boxes of do.; *r r*, pump-rods; *w w*, water-boxes at each lift; *l l*, lift, or bucket-pump; *v*, valve-box of do.; *b*, wind-bore of do.; *d d d*, ladders for use of pumpmen. Owing to the pressure of water on the lower part of a set of pumps, and to the amount of force required to overcome the inertia of a large column of water stationary, as well as the strength of material necessary to resist the inertia of the same in motion, a set of pumps is seldom longer than 40 fathoms, so that for a mine 200 fathoms in depth, five such sets would be used; 70 fathom sets are, however, in operation at a coal-mine in Glamorganshire. Some of the largest pumping-engines raise from 2000 to 3000 gallons of water per minute. The arrangement of pumps, pump-rods, and shaft-fittings for fixing the pumping machinery, also standages for the water of lower sets, form very important features in mining operations. When only small feeders of water are to be contended with in coal-mines, one steam-engine is made to do the work of both raising minerals and water. To raise the water, a rod connects the working-shaft of the engine and the pump-rods in the pit by means of cranks; or, instead of pumps, the water is sometimes raised by water-barrels during the times when the men are not working the minerals. Direct-acting engines—namely, engines without beams, but having the pump-rods connected directly with the bottom end of the piston-rod, and the cylinder therefore standing over the pit—are now occasionally used. They are more simple in construction than the beam-engines, but from comparisons made of the work done by the two kinds of engines for a given consumption of fuel, the direct-acting ones have been performing the least amount of effective work.

The best kind of winding engines, and one which is now coming into general favour with mining engineers, is the double-cylinder coupled engines acting horizontally; and the horizontal cylinders, either single or double, are best adapted for underground haulage. The engines used for the latter purpose should be fitted with the frictional gearing instead of the ordinary cogwheel gearing, so that, when the train of carriages being hauled along the underground railway are accidentally thrown from the rails, and suddenly fasten themselves against the sides of the passage, the gearing may skate and prevent the breakage which is liable to occur with the ordinary tooth-and-tooth wheels. An engine of this description, for underground haulage, has been erected at a coal-mine near Edinburgh, from a design by Ralph Moore, now inspector of collieries, Glasgow.

Where a large stream of water at the surface, near to a mine can be depended upon for regular supply, it is with advantage pressed into the service of the miner. It drives water-wheels, by which the pumping machinery may be most economically kept in motion; minerals are crushed for washing and dressing; fans or pumps worked for ventilating the mine, and washing-machines for washing coal from shale and other impurities, or slime-frames for lead washings.

Recently coal-cutting machines of various kinds,

worked by compressed air, have been introduced, with great advantage, into the collieries of Durham, Yorkshire, Lancashire, and Scotland.

Air-engines are well adapted for subterranean purposes in connection with mining, especially coal-mining, the discharged air being beneficial rather than injurious, as is the case with both steam and water. These engines are in operation in a few coal-mines in Britain, for forcing water and for winding in underground shafts. A steam-engine is required to be constantly in operation at the surface, pressing air into the mine through pipes leading to the air-engine, which is worked by this compressed air. Air-engines are also employed for working coal-cutting machines, which are coming into use.

Dressing Ores for Sale.—The ores being brought to the surface are in nearly all cases subjected to a process of 'dressing'—preparing for the market. The object of this is to remove the earthy minerals, or such as materially interfere with the character of the more valuable ore.

Tin, that is, the black oxide of tin, is usually associated with the *gangue* of the lode, which will be either silicious or aluminous matter more or less coherent. The purpose of 'dressing' is to free the black tin, as much as possible, from this. The ore is first subjected to the operation of stamping, by which it is crushed very fine. It is then submitted to the action of flowing water, by which the lighter matters are carried away, and the richer and heavier ore left behind. Tin is of so much value that 'tin-stuff' containing less than 10 lbs. of black tin to the ton will pay the tin-dresser for his labour, if it is carefully and properly conducted. Several kinds of tables and 'buddles' are employed in cleansing the tin, the entire process depending on a good knowledge of the laws which regulate the flow of water, and the power of water, moving at certain rates, to move particles of solid matter.

Copper Ores when first brought from the mine are subjected to the process of breaking, '*spalling*,' and all the worthless portions are thrown aside. The ore being still mixed with earthy minerals is further broken by a process called 'cobbing;' it is then sifted either by a hand-sieve, a 'riddle,' or by a cylindrical sieve called a 'trommel.' When thus reduced and sorted it is placed in piles for assay and subsequent sale—the value per ton of the stuff in the pile being determined by the quantity of fine copper given by assay.

Lead and Zinc Ores are subjected to nearly the same treatment as copper—the larger lumps of lead ore being selected and sold as 'potter's ore.' Lead slimes, that is, the fine mud which accumulates in the process of dressing the ores, are subjected to a washing process analogous to that used for tin, by which the fine particles of galena are collected and the earthy matter washed away. In many cases it becomes necessary to separate two or three metalliferous minerals one from the other, as zinc (sulphide of zinc), lead (sulphide of lead), and iron pyrites. When this has to be effected machinery is employed, which is of the most ingenious character, and which requires in its operation great practical skill and much attention.

Such is a very general sketch of the operations of mining. It will be understood by all who read the article that the conditions of the labour of mining are such that a peculiar class of men are produced. Perhaps there is no human industry involving more severe toil under circumstances of great difficulty than that of the miner. There certainly are very few of the classes of labourers who cling more tenaciously to that industry in which he has been educated than the miner. For generations we find the same family on the same spot pursuing the same occupation of burrowing into the earth in search of minerals. That which their fathers did they do, and they bequeath the same rules, customs, and superstitions to their children. The drawing on the plate ('holers' at work) is given to convey a legitimate idea of the character of the toil which the miner has to undergo. With all his faults—and they are many—the British miner is, as a French writer calls him, the 'hero of the abyss.' He is unwearying in his labour, brave when necessity demands, and under circumstances of severe trial most patient and uncomplaining.

MINING RECORDS. Since in the operations of extracting from the rocks, either metalliferous ores from veins or fissures, or coal from beds or seams, vast spaces must be left, which, when the works are suspended or abandoned, become filled with water or deleterious gases, it is of the utmost importance to those who are commencing new mine works in the neighbourhood of the old ones, that they should know exactly the extent the former miners had carried the subterranean galleries or levels. The want of this knowledge has often led to the most disastrous accidents. The miners, by breaking into an ancient mine filled with water, under the pressure due to the depth of the workings, have found themselves suddenly borne away before an irresistible flood from which there was no escape, and outbursts of accumulated gas have occasioned lamentable loss of life. For these and many other reasons connected with mining enterprise it is of the utmost importance that reliable records of all our subterranean works should be most carefully preserved. This was curiously neglected, although strongly urged by Werner, the great mineralogist, until, about 1797, the national importance of collecting and preserving mining records was forcibly insisted upon by Mr. William Thomas, of Newcastle, and strenuously advocated by William Chapman and other eminent authorities. Nothing, however, was effected towards carrying out this until, in 1838, Mr. Thomas Sopwith brought the subject before the council of the British Association, then meeting in Newcastle-upon-Tyne, and secured their unanimous assent to the following resolution:—'That it is the opinion of this meeting that, with a view to prevent the loss of life and of property which will inevitably ensue from the want of accurate Mining Records, it is a matter of national importance that a depository should be established for the collection and preservation of such Mining Records of subterranean operations in collieries and other mining districts.' A committee was formed, and a memorial was presented to the lords of the treasury, urging 'the expediency of establishing as soon as possible a national depository for the preservation of documents relating to the mining operations of the United Kingdom.' The lords of the treasury adopted this recommendation, and on the 29th of September, 1840, the Mining Record Office was established, in connection with the Department of Woods, and was placed under the direction of Mr. De La Beche, then director-general of the geological survey. The Mining Record Office in Jermyn Street, London, now possesses a large collection of plans and sections of mines and collieries, which can be examined without fee, by parties interested in mining operations. Very careful records of the mineral productions of Great Britain are kept, and these have in many cases been extended back into the last century. Every year since 1847 the Mineral Statistics of the United Kingdom, collected by Mr. Robert Hunt, have been published, containing the records of the produce of British mines, and much information connected with the mineral and metallurgical industries of that country. See MINING.

MINISTER, properly a chief servant; in political language, one to whom a sovereign intrusts the

direction of affairs of state. In modern states the heads of the several departments or branches of government are ministers of the government. The term minister is also used for the representative of a sovereign at a foreign court. (See MINISTERS, FOREIGN.) In Britain the words *ministry* and *ministers* are used as collective names for the heads of departments, but the individual members are not so designated. In the United States of America the heads of the departments are called *secretaries*, but are not termed *ministers*. In most large countries we find a minister for foreign affairs (whose duties are included in those of the secretary of state in the United States), a minister of the interior (in England secretary for the home department; in the United States there is no such department, and the secretary of state has charge of the affairs which would fall to such minister). The minister of the interior has the management of all domestic affairs, roads, canals, &c., levying taxes (in many cases); in short, everything which does not belong to the other departments; and it may easily be imagined how the importance of this department varies as the government is more or less absolute, and disposed to exercise a more or less minute control over its subjects. In Prussia, where the government interferes in all the concerns of life, the minister of the interior is a most important person. On the continent of Europe, where the judiciary is considered a branch of the executive administration, there is always a minister of justice, whose office is incompatible with the independence of the judiciary and with the whole idea of the administration of justice entertained in Britain and the United States (though in the former country the highest judge, the lord high-chancellor, is a member of the ministry). There is, further, a minister of finance (in Britain the chancellor of the exchequer, in the United States the secretary of the treasury). In some states there is, besides the minister of finance, a minister of the treasury. There is also a minister or secretary of war, and in maritime states a minister or secretary of the navy, and sometimes a minister for the colonies. There is often a separate minister of commerce (in Britain the president of the board of trade); a minister of the police (first established by the directory in France). In many countries on the Continent, where the idea of a well-regulated government is unhappily confounded with a concentration of all powers in a few individuals, there is also a minister of public worship, who has the direction of all ecclesiastical affairs. This department, though it also exists in Catholic countries, as in France, yet has received the greatest development in Protestant countries in which the monarchs have declared themselves the heads of the church, and the officers of religion are considered to a certain degree servants of the government. We often find a minister of instruction, generally the same with the minister for ecclesiastical affairs. A minister of the household often directs the private affairs of the monarch. Though the name of the ministers in most countries correspond, yet their power is very different in a *bureaucracy* (see BUREAU), where it extends in minute ramifications through the whole organization of society, and in a country like Britain, where the concerns of the particular corporations are independent of their control. In the former class of governments each minister is a sort of viceroy in his department. One of these ministers is, in many countries, prime-minister, or *premier*, who, in constitutional monarchies, is considered as the chief person in the administration. Sometimes he has no particular department. In France he is called minister president. In Britain the prime-minister is the one who receives the king's order to form a ministry, and therefore to appoint men of his own sentiments. He is generally the first lord of the treasury. In some countries there is also a president of the ministry. In the United States of America there is no such post as that of *premier*, because everything is done in the name of the president, who in many points corresponds to the premier of a constitutional monarchy. The modern idea of constitutional monarchies, in which two most heterogeneous principles, the inviolability of the law and that of the monarch, who thus stands above the law, were to be reconciled, produced a skilful contrivance—the responsibility of ministers—in order to leave the inviolability of the monarch unfringed, and yet to put a check upon the arbitrary use of his power. Europe owes this development of constitutional laws, as most of the improvements in her political institutions, to England. One or more ministers in Britain (and in most other constitutional countries) countersign official orders, and by thus doing become responsible for the contents. This responsibility is always a delicate thing, because it is impossible to define with exactness what constitutes unconstitutionality and a violation of the public interest; and hard as it may appear in the abstract, the question must be left to the houses of legislature to decide in case of an impeachment of the ministers. In general, however, there is little danger of the ministers being impeached, except for very flagrant violations of law, or in times of very violent party spirit. Peculation also forms a ground of impeachment. In the United States of America no such responsibility rests on the secretaries, nor is their countersign requisite, for the simple reason that the president himself is answerable for everything which he does, and may be impeached. Though the sovereign in constitutional monarchies has the full right of appointing his own ministers, and also of dismissing them according to his pleasure, he is, nevertheless, under the necessity of appointing such as will satisfy public opinion or the legislature will not grant supplies, and in fact will not co-operate with the administration. This power on the part of the legislature of granting or withholding supplies forms one of the main bulwarks against arbitrary encroachments on the part of the sovereign or his ministers. In Britain the command of a majority in the House of Commons has become indispensable for the ministers, so that the loss of any important bill brought in by them is regularly followed by the resignation of the premier. This applies, however, only to what are denominated cabinet questions, in respect to which it is considered necessary that the ministry should be united. Where a difference of opinion is openly professed by the ministers themselves the question is not a cabinet question, and the failure of a bill proposed by a minister respecting it is not considered fatal to the administration. Thus the Catholic emancipation was for a long time not a cabinet question, and when Canning lost his bill, in 1827, he nevertheless did not give in his resignation. The situation of the constitutional monarch in Great Britain, and many other reasons in the organization of the governments of those countries, render it necessary for the ministers to be present at the parliamentary debates, and to support their measures; in fact one member of the cabinet, the lord high-chancellor, is, *ex officio*, president of the House of Lords. In Britain members of the ministry who are not peers have no seat in Parliament unless they are elected to the House of Commons, but it is considered indispensable that they should be there. In the United States of America no secretary can sit in either house, as the constitution prohibits any officer of government from being chosen a representative or senator. A minister with-

out portfolio is one who is a member of the ministerial council without being charged with any department of administration.

MINISTERS, FOREIGN. In the article DIPLOMACY some account has been given of the history of embassies; it remains here to speak of the different classes of foreign ministers as they now exist. Every person sent from one sovereign government to another, and accredited to the latter in order to transact public business of a transient or permanent character in the name of his government with that to which he is sent is a foreign minister. Sometimes such ministers are sent merely to be present at the coronation of a foreign prince; sometimes to settle disputed points; at other times to reside permanently with the foreign government. Generally they are divided into three classes. Those of the first class, to whom in France the title of *ambassadeurs* is restricted, are not merely the agents of their government, but represent their sovereign personally, and receive honours and enjoy privileges accordingly. They can be sent out only by such states as possess royal honours. The extraordinary ambassador is reckoned as of higher rank than the ordinary. The legates and nuncios of the pope also belong to this class. The second class are those called by the joint title of *envoys extraordinary and ministers plenipotentiary;* they represent their government. To this class also belong the Papal internuncios. The Congress of Aix-la-Chapelle added to this class another, differing from the second in none of its functions, but of lower rank and less expensive. Ministers of this class are called *ministers resident* (*ministres résidents*) and ministers *chargés d'affaires*. The third class are the *chargés d'affaires*, who are accredited not by the sovereign or government, but merely by the ambassador, for the purpose of maintaining the communication with a foreign ministry. Foreign ministers of the first two classes (including that added by the Congress of Aix-la-Chapelle) are accredited to the sovereign himself, and can demand audiences. The title of *excellency* belongs of right to ambassadors of the first class, and at some courts it is given by courtesy also to those of the second class, including ministers resident and ministers *chargés d'affaires*. Persons who are sent merely to conduct the private affairs of their monarch or his subjects in a foreign place are called *agents* or *residents;* and where they are occupied chiefly with subjects of a commercial character they are called *consuls* (see CONSUL). They are not considered diplomatic persons, and do not enjoy privileges accordingly. Ambassadors and even ministers plenipotentiary have young gentlemen with them, called *attachés*, who have no particular charge, but merely this title to connect them with the legation, and to give them thus admission into the highest society. Sometimes they are sons of noble families, who are preparing themselves for diplomatic offices, but think it beneath their dignity to accept an appointment as secretary of legation. The suite of ambassadors always includes more individuals than the business of the embassy requires, a certain degree of pomp being considered necessary. An ambassador has generally three, always two secretaries of legation; other ministers often but one. A foreign minister receives letters of credence from his court, which, after having delivered an attested copy to the secretary of state, he gives himself to the monarch or head of the government, if he is an ambassador, in a public audience; if not, in a private audience. After the reception of the credentials the minister is said to be acknowledged. In some countries he puts the arms of his nation or sovereign on his mansion. After his credentials have been received he makes formal visits to the other ambassadors, to be recognized by them as such. From the moment that a minister enters the territory of the sovereign to whom he is sent, his person is held sacred and inviolable, and he acquires important privileges. To these belongs, first of all, his freedom from territorial restrictions, that is, he is not regarded as an inhabitant of the country, but his person, suite, house, equipage, &c., are considered as never having left the country to which he belongs, and as being without the jurisdiction of that in which he actually resides. From this follows the freedom of foreign ministers from the civil and criminal law; and the same applies to their suite; and all property belonging to him as minister is free from all taxes, &c. No common police-officer, tax-gatherer, or other public servant, can enter his residence and make inquisition, as in the house of a private citizen. The privilege formerly appertaining to ambassadors, by means of which, upon hanging up the arms of their sovereign, they could exempt from the laws of the land the whole quarter of the town or city in which their residence happened to stand, is abolished as an abuse. The only case in which an embassy may be searched by the authorities of the country in which it is situated is when a political offender is supposed to have concealed himself there. Ordinary criminals who take refuge in the residence of an ambassador are now usually delivered up. The freedom from taxes of all property belonging to the embassy has been subjected to many restrictions in consequence of the occurrence of abuses of this privilege. Foreign ministers are not free from bridge and turnpike tolls or letter-postage. One of their especial privileges is that of worshipping according to the forms of their own religion in countries where their religion is not tolerated. In transacting business they sometimes have immediate intercourse with the sovereign himself, and then address him in a private audience orally, or by the delivery of memorials; but more commonly their intercourse is through the minister for foreign affairs. This state of things continues till the termination of the embassy, which may occur in different ways, either by the expiration of the term of the credentials, by a recall, by a voluntary or compulsory departure, or by the decease of the minister. A recall occurs when the object of the embassy is obtained or defeated; sometimes it takes place in consequence of a misunderstanding, and sometimes from private reasons. A minister often voluntarily leaves a court without being recalled, when he thinks he suffers personal injuries contrary to the laws of nations. There are cases, however, in which a minister is compelled to leave a court, when it is termed a *removal*. In general an embassy is considered as ended from the moment when the minister shows his letters of recall, or receives his passports for his journey home. When these are furnished him he must leave the country, but his person remains inviolable even in case of war, and he is allowed to retire unmolested. Couriers and expresses belonging to an embassy enjoy the same inviolability in time of peace. All these regulations have naturally been introduced among the European powers since the establishment of the permanent residence of foreign ministers, that is, since the Peace of Westphalia. Republics do not send ambassadors in the European sense of the word. Venice, indeed, formerly sent ambassadors; but the United States send only ministers plenipotentiary and *chargés d'affaires*, although the constitution uses the term *ambassador*. Other states also vary the name, but the powers are usually the same. See Moshammer's Europäisches Gesandtschaftsrecht (Landshut, 1806) and Le guide diplomatique of Martens (fifth edition, Leipzig, two vols. 1866).

MINK (Swedish, *Mank*), a genus of carnivorous mammals, included in the family of the Mustelidæ or Weasels, and found inhabiting the northern regions of Europe and America. The minks are nearly allied to the polecats; the American Mink (*Vison lutreola*) being the most typical form; whilst the Black Mink (*Putorius nigrescens*) is also another familiar species. The fur of the latter form closely resembles that of the sable marten, and is imported into Great Britain in large quantities as a commercial 'sable' fur. The European and American species are nearly related, and it is considered doubtful by some authorities if good grounds exist for their specific separation. The former animal is of a brownish-red colour, and possesses a fur which is much more valuable than that of the American species. It inhabits the banks of streams, and feeds on frogs, craw-fish, &c. The American species swims and dives well, and appears occasionally to devastate the poultry-yards in its neighbourhood, besides feeding upon rats and mice. The European species has a strong musky odour, whilst the American mink, when irritated, exhales a fœtid odour, like many other members of the weasel family. It is said to be readily tamed, although it retains, even when domesticated, some of its natural and ferocious qualities.

MINNEAPOLIS, a city of the United States, capital of Hennepin county, Minnesota, on both sides of the Mississippi, at the Falls of St. Anthony, 8 miles N.W. of St. Paul. It is regularly laid out with avenues 80 feet wide running east and west, having double rows of trees on each side, and crossed by streets running north and south. The public buildings include the court-house, city-hall, academy of music, opera-house, athenæum, the University of Minnesota, over 50 churches, numerous schools, &c. The principal industries are the manufacture of flour and lumber, for which St. Anthony's Falls supply abundant water-power; there are also extensive manufactories of engines, boilers, water-wheels and other machinery, agricultural implements, carriages and wagons, furniture, boots and shoes, &c.; pork-packing is also carried on to a considerable extent. It is the centre of an important railway system which connects it with the North Pacific Railroad, with Duluth, with St. Paul and the diverging lines. The city was incorporated in 1867, and annexed the city of St. Anthony on the east side of the river in 1872. Population in 1870, 18,079; in 1880, 46,887.

MINNESINGER, or MINNESÄNGER (from O. German *minne*, love), the name given to the German lyric poets of the twelfth and thirteenth centuries, on account of love being the chief subject of their poems. The cradle of German lyric poetry was Austria, and more especially Upper Austria. The earliest German poetry was chiefly narrative, and this not only when past events formed the poet's theme, but also when he celebrated present occurrences. But this contact with the present naturally gave occasion to the expression of the feelings of the poet, and hence gradually led to the lyric pure and simple. Such was the origin of the oldest extant poems of Dietmar von Eist (1143–70) and others. But the development of German lyric poetry was greatly hastened by the influence of the French poetry of the same class, which at that time flourished in its full splendour in Champagne and Flanders. The immediate effects of this French influence were greater strictness and variety in the versification, a more decided preponderance of the subject of love, and a more purely lyrical form of treatment. The Westphalian Heinrich von Veldeken, who was afterwards unanimously regarded by the minnesingers as the true father of their art; Friedrich von Hausen, a native of the Palatinate; the Thuringian Hugo von Salza, the Saxon Heinrich von Morungen, the semi-mythical Heinrich von Ofterdingen, and the two Suabians Heinrich von Rucke and Ulrich von Gutenburg, were the chief minnesingers of the period immediately following the introduction of the French lyric into Germany, that is, of the latter half of the twelfth century. Already in the twelfth century lyric poetry had thus spread itself over all Germany; the thirteenth century witnessed its highest cultivation, but also the beginning of its decay. The greatest masters of this century are Walther von der Vogelweide, Wolfram von Eschenbach, Gottfried von Strassburg, and Hartmann von der Aue. Although, as has been already mentioned, it is the case that after the influence of the French lyric came to be felt in Germany, love became more particularly than heretofore the subject of such poetry in Germany also, yet the German lyrists were still distinguished from the French by the greater attention which they bestowed upon other subjects; and this national difference is nowhere more copiously illustrated than in the poems of these minnesingers. Their poems may be divided, according to the subject, into three great sections, those devoted to the praise of women, to God, and to their masters. All these poets just mentioned flourished in the early part of the thirteenth century. Of those who succeeded them the most deserving of notice are Otto von Botenlauben, Ulrich von Singenberg, Gottfried von Neifen, Walther von Metz, and Ulrich von Lichtenstein. Before the close of the century the muse of lyric poetry seemed to have altogether fled from Germany; and even the most important of the poets of this period, Konrad von Würzburg, who achieved considerable success in narrative poetry, was unable to recall her. After the art had ceased to be practised by the minnesingers, it was taken up by the artisans of the towns under the name of *meistersingers*.

The minnesingers were knights, or at least men of noble descent, who lived and sang at the courts of princes who loved and protected the arts. After the fashion of the Provençal troubadours, the minnesingers engaged in poetical contests for the gratification of princes and ladies of the court. Some among them were poor, and earned their living by reciting their songs from court to court; but most of them sang merely for pleasure when their swords were unemployed. Not a few princes took part in these songs. This poetry was essentially chivalric, and breathes the romantic spirit of that extraordinary age. Every poet sung his compositions, and accompanied them himself. Travelling players, who made a trade of singing these lyrics, learned them from the authors themselves, and went about from castle to castle repeating them, and even carried them far beyond the boundaries of Germany. It was by no means common for the minnesingers to commit their own poems to writing; some of them, indeed, as Wolfram von Eschenbach, did not so much as know how to write. But the travelling minstrels, who repeated the poems of the minnesingers, especially towards the close of the period when writing became more common, wrote down the songs to assist their memory; and it was to a great extent from these books of the travelling minstrels that the manuscripts which have come down to us were derived. Hence these manuscripts belong in large part to the decline of the poetry of the minnesingers. The principal of these manuscripts are the Heidelberg MS. (published by Pfeiffer, Stuttgart, 1844); the Benedictbeuern MS. at Munich (Carmina Burana, published by Schmeller, Stuttgart, 1847); the Weingarten MS. at Stuttgart (published by Pfeiffer and Fellner, Stuttgart, 1843), and the most extensive

collection of all, containing from 1400 to 1500 pieces by 140 poets, made by the burgomaster of Zürich, Rüdiger von Manesse, in the beginning of the fourteenth century. An attempt to collect all the poems preserved in the different manuscripts was made by Von der Hagen in his Minnesänger (Leipzig, 1838). A good selection was published by Bartsch under the title Deutsche Liederdichter des 12 bis 14 Jahrhunderts (Leipzig, 1864). A critical edition of the older and more important minnesingers appeared at Leipzig in 1857, under the title Des Minnesangs Frühling. The editors were Lachmann and Haupt. L. Tieck published 220 poems, modernized from the Manesse collection, under the title of Minnelieder aus dem schwäbischen Zeitalter (Berlin, 1803). See CHIVALRY, MEISTERSINGER, and MINSTRELS.

MINNESOTA, in North America, one of the states of the American Union, bounded north by British America, east by Lake Superior and Wisconsin, south by Iowa, and west by Dakotah; greatest length, north to south, 440 miles; breadth, along the forty-fifth parallel of lat., 365 miles; area, 83,365 square miles. It occupies the summit of a central plateau formed by the conterminous basins of the Mississippi, the St. Lawrence, and Lake Winnipeg. Except in the north-east, where there is a group of sandhills rising to the height of about 1680 feet, the surface is generally an undulating plain, with an average elevation of about 1000 feet. The general slope is south-east towards the basin of the Mississippi, which, with its affluents, drains about two-thirds of the state. Besides the Mississippi the only important rivers are the Red River of the North, which forms part of the west boundary; and the St. Croix, which forms the eastern boundary until it joins the Mississippi, after which the joint-stream forms the eastern boundary. The banks of the Red River are bordered by extensive alluvial flats of great fertility; but those of the Mississippi present a number of rocky limestone cliffs, often remarkable for their picturesque scenery. About three-fourths of the surface are well adapted for the cultivation of the cereals and roots of the temperate zone, the soil consisting generally of a dark calcareous loam, abounding in organic and saline matters, and retentive of moisture. In the twenty years from 1850 to 1870 the cultivated land rose from 1900 acres to 1,863,316 acres. The chief agricultural products are wheat, oats, and Indian corn. The country, especially above lat. 46°, is well wooded. Far to the north forests of pine occur; on the river flats basswood, aspen, ash, maple, linden, butternut, &c., abound, and in the swamps, tamarack, cedar, and cypress. The wild animals include the elk, deer, antelope, wolf, bear, otter, racoon, the eagle, grouse, pheasant, partridge, buzzard, pelican, and vast flocks of wild ducks, wild geese, and other water-fowl. The buffalo is no longer found east of the Red River. The lakes, which are numerous, though small, abound, as do the streams themselves, with many varieties of fish. The climate is on the whole excellent, the winters, though cold, being clear and dry, while winds and breezes temper the excessive summer heats. The vast amount of water-power is very favourable to manufactures. The school system is well developed, and is supported by land grants, and by local and state taxes. The state university is at Minneapolis; there are also three normal schools supported by the state, besides numerous academies and several colleges kept up by denominational or private enterprise. The lines of the St. Paul and Pacific Railway, and the Northern Pacific Railway, unite in the western part of the state, and various branches proceed from these lines in different directions; total length of railway lines at end of 1882, 3974 miles. For administrative purposes Minnesota is divided into seventy-eight counties. St. Paul, situated near its east frontier, is the capital, but Minneapolis is the commercial metropolis. The legislature consists of a house of representatives of 103 members, elected for one year, and a senate of forty-seven members elected for two. The executive consists of a governor, lieutenant-governor, secretary of state, treasurer, and attorney-general, all elected for two years. The judges are also elected, those of the supreme and district courts for seven, and those of the other courts for two years. The state sends two senators and three representatives to the national congress. Minnesota is supposed to have been first visited by white men in 1654. The first settlements were made by the United States in 1845. In 1849 it was organized as a territorial government; and in 1858 was admitted into the Union. Pop. in 1870, 439,706; in 1880, 780,773.

MINNESOTA, or ST. PETER'S, a river in the United States, having its sources in a series of lakes between lat. 45° and 46° N. in Minnesota, flows south-east for about 300 miles, till it receives the Blue Earth, when it turns north-east, and continuing in that direction for about 120 miles, joins the Mississippi at Fort Snelling. Owing to a rapid which occurs 40 miles above its mouth, it is navigable by steamers only for that distance, but small boats ascend about 250 miles farther.

MINNOW, the popular name applied to several species of small fishes inhabiting fresh-water ponds and rivers, and also to the young of larger fishes. The true minnow of English rivers is a small cyprinoid fish—the family Cyprinidæ including the Carps, Barbels, Roaches, Chub, and other familiar forms. The minnow spawns in June, the young attaining a length of about three-quarters of an inch in the succeeding autumn. The adult minnow seldom exceeds 3 inches in length.

MINOR, in music. See MAJOR.

MINORCA (Latin, *Balearis Minor;* Spanish, *Menorca*), an island in the Mediterranean, belonging to Spain, and so called from being the second largest of the Balearic group; greatest length, N.N.W. to S.S.E., 35 miles; average breadth, about 10 miles; area, 260 square miles. It is situated E.N.E. of Majorca, from which it is separated by a strait of 27 miles broad. The coast is very much indented on all sides except the south, and generally presents a succession of bold headlands, inclosing small creeks and bays, of which several form good harbours. Of these the best and most frequented is Port Mahon, the capital of the island. The coasts are rugged, and the surface broken and mountainous. Mount El Toro in the centre attains the height of about 5000 feet. The soil is not generally fertile; still, in good seasons, the quantity of wheat and barley grown is sometimes equal to the consumption. The other principal products are oil, wine, hemp, flax, oranges, and lemons. Some good cheese is made, and considerable attention is paid to the rearing of bees. There is an abundance of small game on the island. Iron, copper, and lead are found in abundance, but are not worked owing to the scarcity of fuel, and marble, porphyry, and alabaster might be worked in several districts. The inhabitants make excellent sailors, but generally are very indolent, ignorant, and bigoted. The first possessors of Minorca were the Carthaginians, who drew from it a number of excellent slingers, who distinguished themselves during Hannibal's wars in Italy. It afterwards passed successively into the hands of the Romans, the Vandals, and the Moors. The last were expelled in 1285 by the Spaniards. During the greater part of the eighteenth century it belonged to the British, who finally ceded

it to Spain at the Peace of Amiens (1802). The island belongs to the same administrative division with the rest of the Balearic Islands, and is itself divided into the four districts of Mahon, Alayor, Mercadel, and Ciudadela. Pop. 39,005.

MINORITES. See FRANCISCANS.

MINORITY. See AGE.

MINOR PLANETS, the numerous asteroids revolving round the sun outside the orbit of Mars and within that of Jupiter. See ASTEROIDS and also PLANETS.

MINOR PREMISE, in logic, that premise of a syllogism which contains the minor term, or the subject of the conclusion. See LOGIC—Ratiocination.

MINOS, two names in Greek mythology.—1. A ruler of Crete, said to have been the son of Zeus and Europa, and a brother of Rhadamanthus. During his lifetime he was celebrated as a wise lawgiver and a strict lover of justice, and after his death he was made with Æacus and Rhadamanthus, one of the judges of the infernal world. All three sat at the entrance to the kingdom of shades. Minos, as the chief justice, delivered the sentence.

2. A grandson of the preceding, son of Lycastus, son of the elder Minos and of Ida. Homer and Hesiod, however, know of only one Minos, of whom they give nearly the same accounts as subsequent traditions do of the later Minos. This second Minos was the husband of Pasiphaë, whose unnatural passion gave birth to the Minotaur (which see). He was king of Crete, but is not represented as having succeeded to the kingdom, but by one tradition as having acquired it through the favour of the gods, and by another as having conquered it over his brother Sarpedon. He also is said to have been a Cretan lawgiver, and was famed for his wisdom and justice, although later accounts make him out to have been a cruel tyrant. He is said to have made war upon the Athenians to revenge the death of his son Androgeos, who was killed at the festival of the Panathenæa by the candidates whom he had defeated at the games, according to others by Ægeus himself, the king of Athens. Minos having defeated the Athenians, exacted from them every year (other accounts say every nine years) a tribute of seven youths and seven maidens, who were devoured by the Minotaur. Theseus delivered the Athenians from the burden of this tribute.

MINOTAUR. Fable makes this being the son of Pasiphaë and a bull, and ascribes to him the body of a man with the head of a bull, or the head of a man and the body of a bull. He ate human flesh, on which account Minos confined him in the labyrinth built by Dædalus, and at first exposed to him criminals, but afterwards the youths and maidens yearly sent from Athens as a tribute, until at length Theseus, who was comprehended among the youths, and was instructed and armed by Ariadne, the daughter of Minos, killed him, and freed the Athenians from this tribute.

MINSK, a government of Russia, bounded north by Vitebsk and Vilna, west by Vilna and Grodno, south by Volhynia and Kiev, and east by Czernigov and Mohilev; greatest length, north to south, 290 miles; average breadth, 150 miles; area, 35,293 square miles. This government, though generally flat, is traversed in the north by part of the great dorsal ridge which forms the watershed between the basins of the Baltic and the Black Sea. The chief rivers are the Beresina and the Pripet, both tributaries of the Dnieper, which bounds the government on the south-east. The Dwina bounds it on the north. In the south portion of the government large marshy tracts extend on both banks of the Pripet, and in spring are generally under water, giving the whole country the appearance of one vast lake. In such circumstances anything like a regular system of agriculture is altogether impracticable. Much of the rest of the soil is sandy. Barley and oats are grown in far greater quantity than might be expected in the circumstances, and fully equal to the consumption. Hemp and flax also are raised in considerable quantities, and some hops and tobacco. The chief wealth of the country is in its forests, which occupy a large part of the surface, and, where the ground is dry, yield excellent timber. A great proportion of the inhabitants are employed in felling it, and preparing it for market. Neither manufactures nor trade have made much progress. The former are almost confined to linen-weaving; the latter is chiefly in wood, mats, potash, meal, hemp, flax, honey, wax, and some horses and horned cattle. The wild animals include the elk, wolf, and lynx. The inhabitants are mostly Rusniaks, of the orthodox or United Greek Church; but Roman Catholicism is generally professed by the higher classes. The pop. is 1,504,576.

MINSK, a town in Russia, capital of the government of the same name, on the Svisloch, 420 miles south-west of St. Petersburg. It is the see of a Greek archbishop and of a Roman Catholic bishop, and contains two castles. It has some manufactures of woollen cloth, hats, and leather, and a considerable general trade. Pop. (1880), 41,720.

MINSTER (Anglo-Saxon, *Mynster*, from *monasterium*) anciently signified the church of a monastery or convent, afterwards a cathedral. In German the word is written *Münster*. Both in German and English this title is given to several large cathedrals, as York Minster, the minster of Strasburg, &c. It is also found in the names of several places, which owe their origin or celebrity to a monastery, as Westminster, Leominster, &c.

MINSTREL (from the old French *menestrier*, now *ménétrier*, and that again from the late Latin *ministerialis*), a name introduced into England by the Normans, and which comprehended singers and performers of instrumental music, together with jugglers, dancers, sleight-of-hand performers, and other similar persons, whose trade it was to amuse the great. The character of the minstrels differed much at different periods; and while we find them at one time the friends and favourites of princes, we see them again in the reign of Queen Elizabeth classed with beggars and vagabonds, and forbidden to exercise their trade. The minstrels often sang the compositions of others, but they were often the authors of the poems which they recited. See Percy's and Ritson's works on minstrelsy; see also the articles MINNESINGERS and TROUBADOURS.

MINT (*Mentha*), a genus of labiate plants, distinguished, however, by having the corolla divided into four nearly equal lobes. The stamens are four, two of them longer than the others. The species are herbaceous, nearly all perennial, having square stems, which bear opposite and simple leaves; the flowers are small, verticillate, collected into clusters in the axils of the leaves. Numerous species are known, all growing in temperate climates, and most of them European. They abound in resinous dots, which contain an essential oil. They have an agreeable odour, and have been celebrated from remote antiquity, both in mythology and from their useful qualities. They partake in the highest degree of the tonic and stimulating properties which are found in all labiate plants. To the taste they are bitter, aromatic, and pungent. The *M. piperita*, or peppermint, is the most powerful, and on this account is most generally employed in medicine. The *M. viridis*, or spearmint, is milder, more agreeable, and is very commonly employed for culinary purposes.

MINT, a place where money is coined by public authority. In England there was formerly a mint in almost every county. Besides the sovereign, barons, bishops, and the principal monasteries exercised the right of coining. From the time of William the Conqueror the great bulk of the coining of England was done in London, but it was not till the reign of William III. that all the provincial mints were abolished. The present mint on Tower Hill, in London, was erected between the years 1810 and 1815. In 1815 a new arrangement was made for the government and management of the mint. It was then determined that there should be a mint board, consisting of a master, a deputy master, a comptroller, an assay master, a clerk of the papers, clerk of the irons, and superintendent of machines. The manufacture of the coins was to be carried on by contract with a distinct branch of the establishment, called the *Company of Moneyers*. Since 1815 several changes have been made in the constitution of the mint. Moneyers' contracts have been abolished, the office of master of the mint has been united with that of chancellor of exchequer, and the offices of deputy master and comptroller have been amalgamated. In the United States the following mints and assay-offices are in operation under the coinage act of 1873: the mints of Philadelphia, San Francisco, Carson City, and Denver; and the assay-offices of New York, Charlotte, and Boise City. In France as in England the number of mints was at one time considerable, and in the earliest times indefinite. Before the revolution there were twenty-seven mints, each of which had a letter or letters of the alphabet for its sign. In 1857 there were still seven French mints, namely, Paris, Bordeaux, Lille, Lyons, Marseilles, Rouen, and Strasbourg. In 1858 those of Lille, Marseilles, and Rouen were abolished, and in 1860 that of Lyons, so that there were only three mints left in France, which remained the number till 1870, when Strasbourg was taken by the Germans.

MINUET (French, *menuet*, from *menu*, little, on account of its short measured steps), a French dance, in slow time, which requires great grace and dignity of carriage. It was the favourite dance in the time of Louis XIV., but has since been supplanted by country-dances, quadrilles, &c. According to Brossard the minuet was originally from Poitou, and is said to have had at first a quicker motion. The name is also given to a piece of music written for such a dance in triple time; such movements being introduced by instrumental composers in symphonies, quartettes, &c. An exquisite minuet occurs in Mozart's Don Giovanni.

MINUTE, a division of time and of angular measure. As a division of time, it is the sixtieth part of an hour. As a division of angular measure, it is the sixtieth part of a degree. In this case it is represented by a sign like an acute accent placed at the upper right hand corner of a number; thus 30′ means 30 minutes.

MIOCENE. See GEOLOGY.

MIQUELON, an island in the Atlantic Ocean, near the southern coast of Newfoundland, at the entrance of Fortune Bay, belonging to France. The southern part of it is called Little Miquelon (*Petite Miquelon*), and was once a separate island, but since 1783 has been connected with it by a sand-bank. The island has been in the possession of the French since 1763. It is under the direction of the commandant of St. Pierre (see PIERRE, ST.), and is occupied only by a few families engaged in the fisheries.

MIRABEAU, GABRIEL HONORÉ RIQUETTI, COMTE DE, the greatest orator of the French revolution, son of Victor Riquetti, marquis de Mirabeau, born in 1749 at Bignon, near Nemours; died at Paris April 2, 1791. At an early age he manifested extraordinary intelligence; but his youth was a stormy and licentious one, so much so that in 1777 he was confined at Vincennes at the suit of his father for rape and adultery, having seduced Sophie, the wife of the President Monnier, and fled with her to Holland. During his imprisonment at Vincennes, which lasted for three years and a half, he wrote his Lettres à Sophie, Lettres de cachet, and L'espion dévalisé. About 1784 he began to devote himself to politics. He visited London, was intrusted by Calonne with a secret mission to Prussia, and published various treatises, which made him sufficiently well known to the *tiers état* to be elected by the town of Aix to be their representative in the States General of 1789. Here he speedily eclipsed all the other orators of the assembly, and he became the centre round which gathered all the men of greatest mark and force of character in the *tiers état*. He was the immediate cause of the French revolution, by the resistance which he offered to the demand of the king after the royal sitting of the 23d of June, 1789, that the *tiers état* should vote separately from the other two orders. It was on this occasion that he gave the vigorous reply to Dreux-Brézé, the grand-master of the ceremonies, who had communicated to the assembly the royal will, concluding with the words, 'Go and tell your master that we are here by the will of the people, and that no one shall drive us out except by the force of bayonets.' Both before and after this occasion he delivered a large number of eloquent speeches, which obtained for him the title of the *French Demosthenes*. Among the most remarkable of these are his address to the king demanding the removal of the troops encamped at Versailles, his speeches on the national bankruptcy, on the civil constitution of the clergy, on the royal sanction, on the right of peace and war, and his reply to the Abbé Maury on ecclesiastical property. After having shown himself a bold reformer, and the most dangerous adversary of the court, Mirabeau ended by offering his support to the throne, although he continued to make a show of opposition to royalty in order to uphold his popularity. This state of matters dates from May, 1790. He is said to have been bought over by Louis XVI., and it is certain that he received from the latter large sums. Half of his debts, to the value of 80,000 francs, were paid; he received himself 6000 livres monthly, and four notes, each of the value of 250,000 livres, were deposited on his behalf in the hands of a third party. These notes were returned to the king after his death. But though it is true that he received from the king these large sums, it appears to be none the less true that in this change of position he acted from conviction, foreseeing the imminence of a great catastrophe, which he desired if possible to avert. Whatever may have been his motives, this conduct, when it became known, naturally raised up against him numerous enemies, and his popularity was already beginning to totter when he was attacked by a fever, which the profligacy of his life had not left him sufficient bodily strength to resist. His remains were buried with great pomp in the Pantheon. Two years later they were exhumed and dispersed by the populace. The style of Mirabeau's eloquence was not exactly such as might have been expected from his fiery character. It was neither by bursts of passion nor passages of loud declamation that he was really distinguished on the tribune. While speaking he usually appeared unmoved and master of himself. He pronounced all his words so distinctly that he was never rapid, even when he was impetuous. Despising volubility, he was always grave, and sometimes even sententious in his manner. He began slow; but his slow and

even hesitating manner never ceased to be interesting, because one always felt that there was a concentrated inner fire. He gradually became quicker as he went on; his efforts were visible, but they were the efforts of an athlete sure of his strength. When once he had measured his subject, and brought it into prominence, all the powers of his mind were brought into play; bursts of eloquence shot forth in every sentence, and his audience was completely carried along with him. See the Mémoires biographiques, littéraires et politiques de Mirabeau, by his adopted son, Lucas de Montigny (Paris, 1834–35); and Correspondance entre le comte de Mirabeau et le comte de la Marck pendant les années 1789–91 (Paris, 1851). In 1872 was published a work on Mirabeau entitled Mirabeau et la constituante. The work is by Hermile Reynald, and was crowned by the French Academy. The works of Mirabeau, preceded by a notice of his life by Mérilhou, were published at Paris in 1825–27. His speeches (Œuvres oratoires) had previously been published separately (Paris, 1819), also among his Œuvres choisies (Paris, 1820 and 1822).

MIRACLE (Latin, *miraculum*, a wonder, a prodigy; in the original Greek *sēmeion*, a sign, *teras*, a wonder or prodigy) is usually defined to be a deviation from the course of nature, or an event in a given system which cannot be accounted for by the operation of any general principle in that system. But this definition seems to omit one of the elements of a miracle, namely, that it is an event produced by the interposition of an Intelligent Power for moral purposes; for, otherwise, we must consider every strange phenomenon which our knowledge will not permit us to explain as a miraculous event. To the atheist, who does not admit the existence of a Supreme Intelligence, a miracle is an impossibility, a contradiction in terms. A miraculous event cannot, indeed, prove the existence of God, for it presupposes it; but it may prove the moral government of the world by the Deity, or the divine character of a communication which claims to come from him. It is in this light that we must consider miracles as the proofs of a revelation; and, in fact, a revelation is itself a miracle. If one claims to be a teacher from God, he asserts a miraculous communication with God; this communication, however, cannot be visible, and visible miracles may therefore be necessary to give credibility to his pretensions. To those who deny the possibility of miracles, a revelation is impossible. The use, then, of a miraculous interposition in changing the usual course of nature is to prove the moral government of God, and to explain the character of it. As to the nature of miraculous events, we may distinguish those which do not appear supernatural in themselves, but are rendered so by the manner in which they are produced, as cures of diseases by a touch or a word; and those which are supernatural in themselves, as in the burning bush which was not consumed, the stopping of the course of the sun, &c. In proof of miraculous occurrences, we must have recourse to the same kind of evidence as that by which we determine the truth of historical accounts in general; for though miracles, in consequence of their extraordinary nature, challenge a fuller and more accurate investigation, still they do not admit an investigation conducted on different principles, testimony being the only assignable medium of proof for past events of any kind. While some writers have entirely denied the possibility of miracles, others have, with the same result, denied the possibility of proving the occurrence of a miracle. Hume's argument on this point is that it is contrary to experience that a miracle should be true, but it is not contrary to experience that testimony should be false: it is therefore more improbable that the miracle should be true than that the testimony should be false. Without dwelling on the ambiguity of the expression 'contrary to experience,' it may be replied that the improbability arising from a *want of experience* of such events is only equal to the probability of their repetition, this being the precise measure of the improbability of their performance. To assert that because miracles have occurred they ought to occur again, or frequently, is to render a miracle impossible: for an event which is frequently occurring would cease to be a miracle. The existence of a Supreme Intelligence being allowed, the infrequency of miracles, or their being against our experience, is no argument against their occurrence. Hume asserts that a miracle is a contest of improbabilities; and there is no need of denying this assertion, as is usually done: the improbability of a miracle is weakened by considering it an event in the moral system of the universe—not a causeless phenomenon, or a useless violation of nature; and the improbability that the testimony to it should be false is strengthened by the publicity of the event, the intelligence and honesty of the witnesses, the consideration of the results which followed it, &c. John Stuart Mill has pointed out that all that Hume proves in his argument on miracles is 'the very harmless proposition' that no amount of testimony would be able to overthrow our universal experience of the truth of the law of causation; but this he believes Hume must be admitted to have made good. But this proposition is one that no believer in miracles is called upon to deny. For the contention of those so believing is not that the law of causation was in any cases suspended, but that in certain cases there is credible testimony to show that a new cause intervened, namely the will of an omnipotent Deity. Further than this, the testimony, under these circumstances, is a fact which it is more easy to account for by allowing the event testified to have actually taken place, than to have recourse to any other hypothesis. In examining the different objections which have been urged against miracles it will be seen that they arise, in general, from a neglect of the existence of a moral system: when it is objected that they are against the *usual course of nature*, that is, against all we know of the government of God, it is forgotten that they are entirely in accordance with his moral government, and that experience as fully proves the existence, and nature as plainly teaches the character, of this government, as of the physical system of the world. Most of the miracles of which history is full may indeed be put aside for want of sufficient testimony, from their being useless, unnecessary, or even unworthy of a wise and good Being, from the circumstance that the workers of them did not lay any claim to divine agency, from their having been without results, &c. We may also reject those which are referrible to false perceptions; those which are merely tentative, that is, belonging to a series of attempts of which some were unsuccessful; those which are doubtful in their nature; those which are merely exaggerations of natural events, &c., especially if they are unconnected with others of a different character, or with moral effects; so miracles which are in support of an established creed, pretended to be wrought by men vested with a divine character in the presence of credulous devotees, if they do not belong to any of those above cited, are to be looked upon with suspicion. But when miraculous powers are claimed to be exerted by the opponents of what is established in public opinion and supported by public authority, in the face of opposition and incredulity, by men without influence or friends, and when they convince and confound their bitterest enemies, and produce a change in their lives and characters as a proof of their conversion,—when these wit-

nesses, with no interested motives, but with the certain prospect of suffering and persecution, come forward and testify their belief, and when all these results are declared to have been produced to prove the divine origin of doctrines calculated to elevate humanity, and the divine mission of teachers, who spoke as no man had ever before spoken,—we are not surely to refer these to the illusions of credulity, or the jugglings of imposture. It is not possible, in a work of this nature, to go into a minute examination of particulars. The subject is fully and ably treated in Campbell's Dissertation on Miracles, in Reply to Hume; in Paley's Evidences of Christianity; in Butler's Analogy of Natural and Revealed Religion, and numerous other works.

MIRACLE PLAYS. See MYSTERIES.

MIRAGE, the name given to certain illusory appearances due to the bending of rays of light in the atmosphere. The earliest attempt to explain the mirage seems to be that of Monge, who accompanied Bonaparte's Egyptian expedition; he thus describes what was observed by the French soldiers: 'The villages seen in the distance appeared to be built upon an island in the midst of a lake. As the observer approached them the boundary of the apparent water retreated, and on nearing the village it disappeared, to recommence for the next village;' he attributed the phenomenon to the hot sand of the desert keeping the lower layers of the atmosphere at a less density than the upper ones; the rays of light from the lower parts of the sky and objects in the distance arrive at the surface separating the less dense layer of air from those above, and are there subjected to total reflection; the eye sees the sky in the direction of the received rays, and this gives rise to the idea of a lake. *Looming* is a phenomenon of the same kind; distant objects appear to be elevated above their true positions, so that an observer sees objects which in ordinary circumstances are beyond his horizon; these objects are often subjected to vertical magnification, so that the looming of ice-cakes, &c., often presents a wonderful appearance resembling spires, columns, and cliffs. Monge mentions looming; the cold water across which it is usually observed is in direct contrast with the hot sand over which the mirage is observed; in both cases the effect seems to be produced by reflection; mirage from the sand, looming from the sky. The appearances vary with the height of the observer's eye, but this variation is not very great in the mirage of hot countries. It is often assumed that rays of light pass through the atmosphere in straight lines; this is approximately true for short distances, but astronomers and surveyors have to correct their observations for refraction. By the laws of optics it is easy to see why a ray passing obliquely through the atmosphere, when this is arranged in horizontal layers of equal density (those of greater density being lowest), should bend, and that a vertical ray should not bend; but optics does not tell us why a horizontal ray is much more refracted than an oblique one. The explanation (first given by Dr. James Thomson) is easy on the undulatory theory of light. The wave front of a horizontal ray of light is at right angles to the ray, and is a vertical plane; now light is less rapidly propagated in the lower layers of air, hence the lower part of the wave front is retarded, and when the light has proceeded some distance its wave front is no longer vertical, and the ray has bent downwards (the ray is always supposed to be normal to the wave front). Thus, in the atmosphere in its normal state the path of a ray of light is always slightly concave downwards. Surveyors correct their observations by assuming that rays received in their levelling instruments have $\frac{1}{6}$ to $\frac{1}{7}$ of the curvature of the earth, that is, the radii of curvature of the rays are from two to ten times the earth's radius. Dr. Everett shows that $\frac{1}{\rho} = \frac{1}{H}(\mu - 1)$, where ρ is the radius of curvature at any point of the path of a nearly horizontal ray of light, μ is the index of refraction of the air, and H the height of the homogeneous atmosphere at the place where the curvature is measured (H at any place is the height which the atmosphere would have if it were everywhere of the density of the place in question). Generally, for rays in a vertical plane, $\frac{1}{\rho} = \frac{1}{H}\left(1 - \frac{96}{n}\right)(\mu - 1)\cos\theta$, where θ is the angle which the ray at any place makes with a horizontal plane, and n measures the rate of decrease of temperature with height, or it is the number of feet of ascent to give a decrease of 1° C. It may be shown that the curvature of a ray depends very little upon the pressure of the air; it is somewhat different at different mean temperatures of the atmosphere, but it mainly depends on the rate of change of temperature with height. If the temperature decreases upwards at the rate of 1° C. for every 95 feet, we find that there is no curvature whatever for a horizontal ray; at a less rapid rate of change of temperature the ray is concave downwards, at a more rapid rate the ray is concave upwards. Now, in Monge's mirage, the hot sand was able to maintain the lower part of the atmosphere at the more rapid rate of change of temperature upwards; hence rays coming from objects were bent upwards, producing the observed effects. Monge's explanation involves the idea of an angle in the ray due to total reflection, thus supposing a perfectly instantaneous transit from one density to another in the layers of air. It is perhaps better to employ the term 'bending' rather than refraction or reflection to indicate the gradual change which takes place in a ray of light passing through the atmosphere. The most rapid bending will of course take place in that part of the atmosphere where the index of refraction changes most rapidly. In the normal condition of the atmosphere, when rays are concave downwards, the effect is to cause objects beyond the mathematical horizon to become visible; if the curvature of the ray were equal to the curvature of the earth, and if no opaque objects were in the path, the ray would proceed round the earth. Looming is due to excessive bending of this kind; we may suppose that the temperature increases with height above the sea, either because a warm wind is beginning to blow, so that the upper parts of the atmosphere are warm (Captain Scoresby remarked the frequency of looming at the approach of an easterly wind, and he mentions the mildness of east winds), or through the lower parts being cooled by contact with ice. Neglecting the curvature of the earth, let us imagine a horizontal plane in the atmosphere at which the index of refraction is a maximum, and at equal heights and depths from which the index of refraction is the same, diminishing regularly from the plane of reference; it is easy to show that rays crossing this plane will return to it and again cross a number of times, the path of a ray being the mathematical harmonic curve or curve of sines; all such rays proceeding from the same point meet each other again after crossing, in a certain point or focus, so that there may be an unlimited number of such foci; thus an unlimited number of real images (which see) of an object are formed, which are seen to be alternately inverted and erect. The investigation of the virtual images generally seen by observers whose eyes receive the bent rays must be left to the reader. It will be noticed that the rays are only bent to or from the

horizontal plane of reference, so that the virtual image seen by an observer may be greatly magnified vertically whilst its horizontal dimensions are exactly the same as if there were no bending of the rays. Professor Everett explains in this way the Fata Morgana and the appearance as of 'castles, obelisks, and spires,' cities with many buildings, forests of naked trees, and great basaltic precipices sometimes assumed by irregularities in cakes and fields of ice. It sometimes happens that several inverted images of an object are seen in the same sky; these may be accounted for by assuming that there are several layers of air, in each of which there is a rapid variation (an increase upwards) of the index of refraction. Professor Everett illustrates the appearances produced by excessive bending of rays of light in the atmosphere by means of a glass vessel containing either two or three liquids differing in their indices of refraction. See Everett's Natural Philosophy, part iv., and his paper in Nature, November 19 and 26, 1874.

MIRANDOLA, a town in Italy, 18 miles N.N.E. of Modena. It is walled and regularly fortified, and is the see of a bishop, and has a fine cathedral, a venerable palace, several convents and hospitals, and several silk-mills. Mirandola with the surrounding territory was for several centuries in the possession of the family of Pico. In 1619 it was raised to the rank of a duchy. In 1710 the last duke was deprived of his possessions for a violation of his fidelity to his feudal superior the Emperor of Germany. In the following year they were sold to Modena. In 1511 the town was taken by Pope Julius II. after a vigorous siege and a gallant defence. The celebrated scholar, Giov. Pico della Mirandola, was sprung from the family that so long ruled over the town from which he took his name. Pop. 3521.

MIRANDOLA, Giovanni Pico della, surnamed the *Phœnix*, one of the brightest ornaments of literature at the time of the revival of letters, born in 1463, was the youngest son of Gianfrancesco della Mirandola, of the princely family of Mirandola, and Giulia, of the family of Boiardo. His youth was marked by an early display of talent. Being destined for the church he was placed at Bologna, to pursue the study of the canon law, at the age of fourteen years. Two years were spent in this course, when his growing repugnance to the study, and his inclination to philosophical and scientific subjects, led him to visit the different parts of Italy and France for the purpose of observation, and to attend the most celebrated schools and most distinguished professors. After seven years of the most assiduous application he went to Rome, and in 1486 proposed 900 theses on all subjects, which he declared himself ready to defend, according to the custom of the times, in public. He challenged all the learned from all countries to dispute with him, and offered to pay the expenses of the journey to those who came from a distance. No one ventured to appear against him, and the envious endeavoured to implicate him in a charge of heresy. Mirandola repelled the charge in his Apologia, a work full of profound erudition. To deprive his enemies of every pretext for their accusations he determined, although not insensible to love and its pleasures, to lead the most rigid course of life, and to devote himself entirely to letters. In consequence of this resolution he threw into the fire five books of amatory poems in Italian. Having next applied himself to the study of biblical literature he published the fruits in his Heptaplus, a mystical or cabalistic explanation of the history of the creation, in which he derives Plato's doctrines from Moses. Two years after he published a treatise in ten chapters—De Ente et Uno—in which he aimed to unite the opinions of Plato and Aristotle. Both of these works are much inferior to what might have been expected from one who enjoyed so great a reputation among his contemporaries; but this reputation seems rather to have been due to the extraordinary splendour of his attainments than to their solid worth. Mirandola died in 1494 at Florence, where he had lived some time in terms of intimacy with some of the most learned and distinguished men of the age, particularly Lorenzo de' Medici and Politian. A collection of his works was published at Venice in 1498.

MIRECOURT, a town in France, in the department of Vosges, on the Madon, 17 miles north-west of Épinal. It has important manufactures of lace, tulle, and articles in embroidery, and is the central locality of a district famous for making all kinds of musical instruments. It has some trade in articles of turnery, sheet-iron, deals, corn, wine, and sheep. Pop. 5480.

MIRROR, a smooth surface capable of regularly reflecting rays of light. A mirror may be (1) a polished surface of glass; (2) a surface of tin-foil on the further side of a sheet of glass (as in the common looking-glass); (3) the surface of a deposited film of silver or platinum on a polished glass surface, so that rays of light to and from the metallic reflecting surface do not pass through the glass; (4) a polished surface of silver, gold, platinum, or speculum metal (a bronze composed of about 32 parts of copper to 15 of tin, small quantities of lead, antimony, and arsenic being sometimes added). Looking-glasses date from the twelfth century; they were a great improvement on the more ancient speculum metal mirrors, whose reflecting surfaces were liable to oxidation from exposure to the air, but they have the disadvantage that there are two reflecting surfaces, one of glass, the other of metal. Polished metals reflect nearly all rays of light at all incidences; glass reflects very few rays at the normal incidence, but the amount of reflection becomes greater and greater as the incidence becomes more and more oblique. Mirrors are usually either 'plane' or 'spherical.' Spherical mirrors are small portions of the surface of a sphere. The law of reflection of light is, Incident and reflected rays are equally inclined to the normal to the reflecting surface at the point of reflection. In optics (which see) this law is applied on mathematical principles to explain the formation of images (which see) in mirrors. Rays of light from a luminous object, after reflection from a plane mirror, enter the eye of an observer as if they had proceeded from an image behind the mirror exactly the same in form and size as the object, and at the same distance behind the mirror as the object is before it. In a spherical mirror, concave or convex, the line through the centre of the spherical surface of which the mirror is a part and the middle point of the mirror is called 'the axis.' From a concave mirror rays parallel to the axis converge after reflection to a point called the 'principal focus,' which is half-way between the centre of the sphere and the mirror. Strictly speaking rays parallel to the axis do not after reflection all pass through the same point unless the mirror is a very small portion of the whole spherical surface, or is part of a paraboloidal surface of revolution. Rays parallel to the axis of a convex mirror diverge after reflection, and appear to come from 'the principal focus' behind the mirror, a point half-way between the centre of the sphere and the mirror. Rays from a luminous object outside the spherical centre of a concave mirror form a small, real, inverted image of the object between the centre and the principal focus; when the object is between the centre and the principal focus the image is beyond the centre, and is large, real, and inverted; when the object is between the principal focus and

the mirror the image is behind the mirror, and is large, vertical, and erect. Rays from an object reflected from a convex mirror always form a small, erect, vertical image behind the mirror between the principal focus and the reflecting surface.

Until recently mirrors were almost universally made by applying a coat of tin-foil amalgamated with mercury to the surface of plate-glass. A sheet of tin-foil is spread carefully and evenly on a stone table having a perfectly smooth and uniform surface bordered by a rising ledge. A little mercury is then rubbed over the tin-foil so as to penetrate every part of it and almost dissolve it, after which more mercury is poured over it till a layer about the thickness of a crown piece is formed, the mercury being prevented from flowing off by the ledge round the table. After having been scrupulously cleaned, the plate of glass is advanced horizontally along the layer, its under edge being depressed below the surface so as to exclude air and remove any particle of oxide or other impurity that may have gathered on the surface of the mercury. When this has been perfectly effected the glass is fixed in its place, and by means of a screw the table is tilted a little to the side, when the superfluous mercury flows off by a gutter running round the outer edge of the table. The table is then restored to its horizontal position, a uniform pressure is applied to the glass by means of weights, and it is allowed to remain in this condition for about twenty-four hours. The plate is then transferred to a shelf which is slightly inclined at first, but as the coating dries the inclination is gradually increased until the mirror reaches a vertical position. This drying and hardening process requires about eighteen days to a month to complete, and even longer for large plates, after which the glass is ready for its frame and back.

The above process of manufacture is objectionable on several accounts: the mercurial fumes to which the workmen are exposed seriously injure their health; the fine metallic lustre of the plate is subject to deterioration by exposure to high temperature or contact with damp; the glass plates are liable to be broken by the weights placed on them; and the coating of amalgam is frequently spoiled by the drops of mercury removing part of it as they trickle down, or by its crystallization, or by mechanical abrasion. These disadvantages have turned the attention of manufacturers to the use of pure silver as a coating substance. In 1835 Baron Liebig observed that on heating aldehyde with an ammoniacal solution of nitrate of silver in a glass vessel, a brilliant deposit of metallic silver was formed on the surface of the glass. To this observation the more recent process of silvering glass is really due. In 1849 Mr. Drayton made known a method in which he employed as a backing composition two ounces of nitrate of silver, one ounce of ammonia, three ounces of alcohol, and three ounces of water. These, after careful mixing, were allowed to stand for some time, after which to each ounce of the compound was added one ounce of saccharine matter (such as grape-sugar) dissolved in equal proportions of alcohol and water. The two processes now most generally employed are quite distinct in character, and are termed respectively the hot and the cold process. In the hot process the plate of glass, after being thoroughly cleaned, is sensitized with a solution of tin. This is well rinsed off, and the glass is laid on a horizontal, double-bottomed metal table heated by steam to about 100° Fahr. A solution of nitrate of silver, ammonia, tartaric acid, and distilled water is poured over it, and the temperature being constantly maintained, in the course of half an hour or so a uniform coating of silver is formed. The silver plate is carefully wiped with chamois leather, and again treated with a somewhat similar solution applied in two portions. It is then wiped a second time to remove all non-adhering silver and refuse, after which it is ready for backing up and framing. In the cold process (which has been adopted for silvering the mirrors of astronomical telescopes) two solutions are prepared, the first consisting of a mixture of nitrate of silver, nitrate of ammonium, and pure caustic soda dissolved in distilled water; the second consists of loaf-sugar dissolved in vinegar and water. These two solutions are quickly stirred together, and poured rapidly and evenly over the glass plate, which is placed on a horizontal table in a moderately heated and well-lighted room. The precipitation of the silver immediately commences, and in about seven minutes the deposit is complete. The exhausted solution and other impurities are then carefully cleaned off, and the coated surface washed with distilled water. The plate is then treated with a second supply of the solution, and once more cleaned and washed with extreme care.—The defects of these two modern processes are that the deposit of silver on glass is not so adherent and unalterable under the influence of sunlight and sulphurous fumes as the old amalgam of tin and mercury; besides, the new processes give the glass a slightly yellowish tinge. These disadvantages have been obviated by applying to the silver coating a weak solution of cyanide of mercury, which immediately forms a kind of amalgam, and renders the deposit at once much whiter and more adherent. The silvering is protected from mechanical abrasion and the chemical action of gases and vapours by a coating of shellac or copal varnish, which when dry may receive a further covering of red-lead paint.

A method of coating glass with platinum has been recently introduced. A solution of bichloride of platinum is spread over the surface of the glass with a fine brush, and the metal is precipitated with oil of lavender. As this summary process produces a somewhat gray lustre it is used only for cheap mirrors, the lids of ornamental boxes, toys, and the like.

MIRZAPUR (Prince's Town), a town in India, capital of the district of the same name, 56 miles south-east of Allahabad, on the right bank of the Ganges. It presents an imposing appearance from the river, in consequence of the fine ghats leading down to it, the numerous mosques and temples, the handsome European houses, occupying some of the most conspicuous sites, but the interior is mainly occupied by mud huts. Large wells of tasteful architecture occur in the principal streets. The city had, until quite recently, the largest mart in Upper India for grain, cotton, and other raw produce, but since the opening of the through railway to Bombay, and the rise of Cawnpore to commercial importance, much of its trade has migrated elsewhere. Considerable manufactures of shellac, brass ware, and carpets still exist. There are imports of grain, sugar, cloth, metals, fruit, spices, tobacco, lac, salt, and cotton; and exports of the same articles with manufactured lac-dye, shellac, and ghee (a peculiar kind of butter). Mirzapur has communication with Allahabad, Benares, and other chief places by means of the India Steam Navigation Company's vessels, and is a station on the East Indian line. The military cantonment is 3 miles north-east of the town, on a kind of peninsula formed by the windings of the Ganges. Pop. (1881), 56,378. The district of the same name has an area of 5224 square miles, and a population (1881) of 1,136,796, chiefly Hindus. It is subject to the Lieutenant-governor of the North-western Provinces, and lies in the division or commissionership of Benares. The chief products are wheat, barley, cotton, oil-seeds, and fruits.

MISDEMEANOUR, in law, any violation of the law less atrocious than a felony. It is punished by penal servitude for life or for a shorter period, fine or imprisonment, or both. To a sentence of imprisonment may be added that of hard labour, solitary confinement, or whipping.

MISERERE (Latin, have mercy), the name by which the fiftieth psalm in the Vulgate is known, corresponding to the fifty-first of the English version. The *miserere* forms part of certain liturgies, and various great composers have taken it as a subject. The *miserere* of Allegri is particularly famous; and this alone, sung by the Papal choir in the *capella Sistina* in the Passion week, would repay the trouble of a visit to the 'eternal city.'

Misrere or *misericord* is also the name of the projecting bracket, usually ornamented with carvings, under the seat of a cathedral stall. It was so made that when the seat was turned up it afforded a rest to the priest while engaged in those parts of the service (sometimes long) at which he was required to stand. The privilege of taking advantage of this support was only granted to aged and infirm ecclesiastics. The correct form of the name is said to be *misericord*, *misericordia* being the word applied in the Roman Church to a mitigation of penance. *Miséricorde* is the name by which such a bracket is known in France.

MISHNA, a compilation of oral traditions and glosses on the Pentateuch, made in Galilee by the Rabbi Jehudah or Judah Hakkodesh, that is, the Wise, who flourished in the second century A.D., and is supposed to have completed the work about the year 220. The derivation of the word is disputed, but it is thought to be most probably connected with the Hebrew *Shani*, second, the Mishna being the second law, as the Pentateuch contains the first. The traditions embodied in it were called in Greek *deuteosis*, which has the same meaning. The Mishna forms the first part of the Talmud, the second part of which, called the *Gemara* or supplement, is merely a number of commentaries on the Mishna, rendered necessary by the extreme brevity with which the latter work is composed. The language in which it is written is Hebrew, but it contains a number of Greek, Latin, and Aramaic words, which had by that time been naturalized in the Hebrew, and also has a few Aramaic idioms. The traditions set down in the Mishna were held by the Pharisees to be of equal authority with the written law of Moses, it was believed that they in fact formed an oral law which was delivered to Moses by God at the same time with the written law, that by Moses it was delivered to Joshua, by Joshua to the elders, by the elders to the prophets, and by the prophets to the men of the Great Synagogue. Such is the statement of the Mishna itself, which the Pharisees accepted. The Sadducees, however, rejected this doctrine, allowing no divine authority to the traditions of the elders, although in many cases they followed them in practice with as much fidelity as the rival sect. See TALMUD.

MISKOLCZ, a town in Hungary, capital of the comitat of Borsod, 24 miles north-east of Erlau. The inhabitants are chiefly employed in agriculture (including both the cultivation of cereals and that of the vine), and have a considerable trade in fruit and in a kind of wheaten bread for which the town is famous. Besides the weekly market there are five annual fairs, which are important. Pop. 21,199.

MISLETOE. See MISTLETOE.

MISNOMER, in law a misnaming or mistaking a person's name. In English law a misnomer in an indictment or information formerly furnished ground in certain cases for a plea in abatement, by which the action would cease. But by 7 Geo. IV. cap. lxiv. s. 19 it was enacted that no such plea would be allowed on account of a misnomer; and the court was empowered to cause the indictment or information to be amended if it were satisfied that the mistake alleged had actually been made. In Scotch law an error in the Christian name of the defender invalidates a summons, even though the person be otherwise correctly designated.

MISPRISION, a neglect, oversight, or contempt, (from old French *mespris*, contempt). Thus concealment of known treason or of felony is misprision. These are both instances of what is called negative misprision. If there is in either case anything to indicate that the person has done anything more than conceal the crime, if he has done the slightest thing to show that he gave his assent to the criminal proceedings, he is guilty of something more than misprision. Misprision of treason is punishable by 1 and 2 Philip and Mary, cap. x. with loss of profits of lands during life, forfeiture of goods, and imprisonment for life. In a larger sense misprision is taken for many great offences which are neither treason, nor felony, nor capital, but very near them; and every great misdemeanour which has no certain name appointed by law is sometimes termed *misprision*. Where misprision consists in something more than mere concealment, in some actual crime committed by a person, it is called positive misprision, or contempt, or a high misdemeanour.

MISSAL (from the Latin *missale*), in the Catholic liturgy, the book which contains the prayers and ceremonies of the mass. It was formed by collecting the separate liturgic books formerly used in the religious services, particularly the Oratorium, Lectionarium, Evangeliarium, Antiphonarium, the Canon, &c., for the convenience of the priest. The greater part of these prayers and ceremonies are very ancient, and some of them have come down from the times of the Popes Gelasius I. (end of fifth century) and Gregory the Great (end of sixth century); some are even older. Considerable deviations and corruptions, which had in the course of time crept into the Missal, induced the Council of Trent to request of the pope a revision of it. Pius V., in 1570, required the Missal, which had been revised under his direction, to be adopted by the whole Catholic Church, with the exception of those societies which for more than two centuries had followed another ritual with the consent of the Papal see. This form of the Roman Missal has been retained until the present time; the changes made by Pope Clement VIII. (1604) and Urban VIII. (1634) (the latter under the direction of Bellarmin) extending little beyond alterations of single expressions, and the addition of a few new masses, which are by no means among the best. There were three sorts of missals. The first kind contained only what the bishops or priests had to repeat or chant at the altar, and was almost the same as the more ancient sacramentary. The second sort contained in addition what was sung by the choir, and was intended for the use of churches of the second grade, which possessed a deacon and sub-deacon, who read the Gospels and epistles, but had not a sufficient number of singers in the choir, so that the priest and his assistants were obliged to assist in this part of the service, and accordingly required a missal containing all that was sung. The third sort came into use about the ninth century. It contained, besides what was included in the missals of the first two sorts, the lessons, epistles, and gospels, and was intended for the use of small country churches which had none of the subordinate ecclesiastics. There were not only these three different sorts of missals, but also many varieties of them having only a local use. Thus in England before the Reformation there were missals of the Here-

ford use, Lincoln use, Bangor use, &c. There are also missals of the Greek Church, the Church of the Maronites, and other Christian sects. The earliest printed missal is the Missale per totius Anni Circulum More Ambrosiano compositum (Milan, 1475, folio), which was followed by the Missale secundum Consuetudinem Romanæ Curiæ (Rome, 1475). These missals, and earlier ones in manuscript, composed for particular churches, especially if on parchment, are objects of bibliomania. Among the most celebrated of the manuscript missals is one of the eighth century, which was used in the church of Florence, and is now in the Barberini Library at Rome. Another celebrated one is that called the Bedford Missal, for an account of which see BEDFORD (JOHN, DUKE OF).

MISSIONS, MISSIONARIES. The first Christian missionaries were the apostles, and by them and their successors Christianity was in the course of a few centuries spread over all parts of the Roman Empire. In some parts, as in Britain, it gave way again before the Germanic invaders of the fifth and sixth centuries, and some of the most noted names in the history of missionary enterprise are those of the missionaries who reconquered for Christianity her lost provinces and introduced their faith among the German tribes in their own homes. St. Augustine or Austin, who was sent by Gregory the Great with forty associates to preach the gospel among the Saxons of Britain at the end of the sixth century, was the first of this missionary group. He was not only completely successful in accomplishing the primary object of his mission, but formed a nursery of zealous preachers, who crossed over to the Continent and planted Christianity in those parts in which the people were still heathen. Such were St. Wilfrid, St. Egbert, St. Willibrod, St. Kilian, who laboured in Friesland, Franconia, and Bavaria in the seventh century. Their labours were continued in the eighth century in Thuringia and Saxony by St. Boniface, a monk of English origin, called from the scene of his labours the apostle of Germany. Germany in its turn sent out the missionaries which converted Denmark, Sweden and Norway, Poland, Hungary, and Bohemia. About the same time the Bulgarians were converted by missionaries from Constantinople, and the Moravians by other preachers of the Greek Church under the direction of St. Cyril and St. Methodius. St. Vladimir also obtained some success in Russia. Prussia, Livonia, and Lithuania were the most reluctant to adopt the new faith, and a mission was sent by the holy see to these provinces as late as the thirteenth century. The Crusades opened up new spheres for missionary efforts in those countries that had been wrested from Christianity by the Saracens. Two religious orders founded at the beginning of the thirteenth century, the Dominicans and Franciscans, devoted themselves to the preaching of the faith among the Mussulmans. About this time missionaries were sent to the East, where the Nestorians, Jacobites, and other sects threatened to separate from the church. Others advanced as far as Tartary, Thibet, and China, but in course of time the persecutions there became so violent that the efforts to Christianize those countries had to be abandoned. A new impulse was given to missions by the discovery of the New World. When the way had been prepared by the Spanish and Portuguese armies a crowd of friars of all orders set out for the West Indies, Mexico, Peru, and Brazil to spread Catholicism. Most of these, however, quickly turned aside from the aim with which they had started, and thought only of enriching themselves as quickly as possible. In order to attain this selfish object they did not hesitate to countenance the unheard-of cruelties practised on the natives by the Spanish and Portuguese governors, soldiers, and settlers. Very few signalized themselves like Las Casas by their disinterested efforts to protect the natives against the rapacity of the invaders, and to gain them over to Christianity by peaceful means. The Asiatic missions were renewed with vigour in the sixteenth century. The powerful order of the Jesuits, which was then founded, turned their attention in this direction, and the celebrated Francis Xavier, a member of the order, proceeded to India, where his efforts were crowned with almost unexampled success. But this success was more sudden than well-founded. It was chiefly due to the violence of the means adopted by Xavier to gain over those among whom he preached. From India Christianity was introduced into Japan, where it had to contend against terrible persecutions, before which the missionaries, after enduring them for thirty years, were compelled to retire. During this time Father Ricci, another member of the brotherhood of Jesus, had penetrated to Peking, and succeeded about the end of the sixteenth century in gaining a firm footing there with the consent of the Chinese Emperor. At the beginning of the seventeenth century some Dominican missionaries, accompanied by a number of other ecclesiastics belonging to various orders, came to take part with the Jesuits in their Asiatic missions. They made Tonquin and Cochin China the centre of their efforts, and pushed out thence into all the neighbouring countries. Their success was considerable, when a dispute broke out between the missionaries of the order of the Jesuits and the new-comers. The former had made it a practice to tolerate among their converts various rites and usages which the other missionaries interdicted as idolatrous. The question having been referred to the holy see was decided against the Jesuits, but the dispute continued, and gradually brought about the decay, and finally the ruin, of the Roman Catholic missions in China. In 1622 Gregory XV. gave a better organization to the Roman Catholic missions by the foundation of the Propaganda, to which Urban VIII. added in 1627 a college intended to prepare young men of different countries to act as missionaries in foreign lands. The foundation of the seminary of foreign missions at Paris in 1663 contributed powerfully towards the same end. The Roman Catholic ecclesiastics who acted as missionaries belonged chiefly to four bodies —Dominicans, Franciscans, Jesuits, and the Fathers of the Foreign Missions. The missions were divided into four regions. The first was that of the Levant, comprising Egypt, Æthiopia, the Greek Archipelago, Turkey in Europe, Turkey in Asia, and Persia. The second was that of China, comprising Cochin China, Japan, and Tonquin. The third was that of India, comprising, besides India itself, Oceania as far as the Philippine Islands. The last included North and South America and the Antilles. The missions of this last region were the most prosperous; and in South America in particular the missionaries, supported by the secular authorities, acquired a considerable influence, both political and religious, over the population. This influence was more especially felt in Brazil, Peru, New Grenada, and in Paraguay, in which last region the Jesuits established a state which they governed themselves.

It was not till long after the Reformation that Protestant nations generally took up the idea of foreign missions. Various reasons may be assigned for this. For a considerable period the Protestants in all countries had enough to do to secure a position for themselves at home to be able to devote any attention to spreading their faith in foreign countries. They were, besides, not so wealthy as the Roman Catholic Church, whose missionary enterprise was at

the same time greatly assisted by the various religious orders, the members of which could be sent to any part of the world she pleased. The earliest Protestant foreign mission appears to have been one which was established in Brazil in 1555 at the instigation of a knight of Malta named Villegagnon, who undertook to found a colony there under the patronage of Henry II. of France on the condition that the reformed religion should be taught to the natives. Gustavus Vasa, king of Sweden from 1523 to 1560, towards the close of his reign sent forth a mission to convert the Laplanders in the northern part of his dominions. Many German princes who had adhered to the cause of the Reformation also interested themselves in the subject of foreign missions during this century and the earlier part of the following one; but the times were too troubled for anything of consequence to be effected. Shortly after the settlement of New England by a band of Nonconformists in 1620 one who afterwards greatly distinguished himself as a missionary arrived in the new settlement. This was John Eliot. Having been inspired with a deep interest in the condition of the North American Indians he set to work to master the language of one of the adjoining tribes, translated the Bible into it, and in 1646 began a regular mission among that people. He was assisted among others by two noted missionaries, Cotton and Mayhew, the latter the first of five members of the same family who in as many successive generations continued the work that Eliot had begun. Cromwell conceived a vast scheme of united Protestant missionary efforts. He proposed to divide the earth, as was done by the Roman Catholics, into four provinces, and to found a college for the education of missionaries by whom these provinces were to be taught. These schemes, however, were not carried out. When the Dutch founded their eastern colonies about the end of the seventeenth century they made some efforts to gain over the natives to the Reformed Church, and when Waldens of Leyden advocated the formation of a missionary seminary the Dutch East India Company strongly approved of the suggestion. These, however, were merely isolated attempts to Christianize the heathen, and were due rather to the accidental circumstances that brought particular Protestant nations of Europe into contact with certain heathen peoples than to the rise of the missionary spirit among the Protestant sects in general. It was only at the beginning of the eighteenth century that this spirit began to manifest itself in the origination of societies having for their object to search out suitable places and means for the diffusion of the Christian faith as it is held by Protestants. The English took the lead in this kind of enterprise, but were speedily followed by Danes and Germans, especially the Moravian brethren. Towards the end of the eighteenth century such societies began to increase rapidly in numbers, and since then have gone on multiplying. Some of the principal of these societies may be mentioned particularly.

In England a body, originally founded in 1698 under the title of the Society for Promoting Christian Knowledge, resolved in 1701 to make it its special object to send missionaries to pagan countries, and changed its title to that of the Society for Propagating the Gospel in Foreign Parts. The society is under the control of the Church of England. The British possessions in all parts of the globe were first cared for. The celebrated John Wesley laboured from 1735 to 1737 as a missionary of this body in Georgia. The Scottish Society for Propagating Christian Knowledge, founded in 1709, laboured for some years among the North American Indians, but without permanent success. The first mission of the Wesleyan Methodists was sent out in 1786, when Dr. Coke and three other missionaries proceeded to the West Indies. During the lifetime of Dr. Coke there was no regularly constituted missionary society among the Wesleyans; but after the death of Dr. Coke in 1813 on his way to India to start a mission there steps were taken to do this. The society was accordingly organized at Leeds in 1814. The Baptist Missionary Society, the operations of which have been crowned with remarkable success, was founded in 1792 in consequence of the exhortations of William Carey, who himself started in the following year as the first English missionary to India. The Baptist society established its head-quarters in India at Serampore, where they set up a printing-press, from which twenty-seven different versions of the Bible proceeded. The two most distinguished missionaries belonging to this society besides Carey were Marshman and Ward. The society afterwards founded stations in the West Indies and West Africa, and in some European states. In 1842 the Baptist Church in Jamaica separated from the original society. The General or Arminian Baptists started a separate society in 1816. The London Missionary Society owed its origin to a paper in the Evangelical Magazine inviting evangelical Christians of all denominations to found a society on a sufficiently broad basis to include them all. The society was actually founded in 1795, and directed its first efforts to the conversion of the natives of the islands of the Pacific Ocean. Tahiti was the island which received the first band of missionaries (March, 1797). China and the East Indies, the Mauritius, Madagascar, South Africa, the West Indies, Guiana, and North America followed. The most important stations are those in the South Sea and in South Africa. The most celebrated missionary to the former was John Williams, who earned for himself the title of the apostle of the Indians; and Moffat and Livingstone have done good work in the latter field. Although this society, as has been said, is so constituted as to include members of all evangelical bodies, yet its management is chiefly in the hands of the Independents, owing to the circumstance that the other leading bodies have separate societies. The year after the establishment of the London Missionary Society the Scotch Missionary Society was organized at Edinburgh (1796). Its first mission station was fixed among the Tartars, near the Black and Caspian Seas. After the suppression of all the Protestant missions in those regions by the Russian government in 1833 this society turned its attention to Western Asia and the West Indies, and latterly has confined its efforts to Jamaica. The Church Missionary Society was established by members of the Church of England in 1799, and its management is still in the hands of that body. Its operations are limited to Africa. At first only German missionaries were employed by it, but since 1825 it has had an institution at Islington for training its own missionaries. The missionary efforts of the Established Church of Scotland date from the year 1824, when Dr. Duff was sent as their first missionary to Calcutta. On the secession of the Free Church in 1843 all the missionaries joined the latter body; but new missionaries were sent out by the Established Church, and both churches now conduct missionary operations. The United Presbyterians, the only other important Presbyterian body in Scotland, have also had a foreign mission since 1847. Their chief station is at Old Calabar, in West Africa. Among the other minor societies of England and Scotland are the Welsh Calvinistic Methodist Foreign Missionary Society (founded in 1840), the English Presbyterian Church's Foreign Mission (1844), the Turkish Missions' Aid Society, the

New Connection Methodists' Foreign Mission (1859), the Glasgow Missionary Society, the Glasgow African Mission Society, the Edinburgh Medical Missionary Society, the Chinese Evangelization Society, &c.

After the missions of Great Britain the next in importance are those of the United States. The first missionary society of that country was founded in 1810 under the title of the American Board of Commissioners for Foreign Missions. Like the London Missionary Society it adopted no denominational basis; but its membership chiefly consists of Congregationalists and New School Presbyterians. Of the missions directed by this board that to the Armenians has proved eminently successful, and has resulted in the establishment of a native Protestant church in Turkey. Winslow, Dwight, and Goodell may be mentioned as among the most distinguished missionaries of this society. The American Baptist Missionary Union was founded in 1814. Its principal mission fields are in Asia, from India to China. That to the Karens of the Eastern Peninsula has turned out especially prosperous. The Methodist Episcopal Church Missionary Society, founded in 1819, has stations in Germany, Liberia, China, India, South America, and other places. The Protestant Episcopal Church Missionary Society, founded in 1820, operates in Western Africa, China, Greece, Brazil, and Japan. The Presbyterian Church Old School Missionary Society has been in existence since 1837, and has stations in Liberia, India, China, California, South America, and Japan. Among the other American societies are the Evangelical Lutheran (1841), the Baptist Free Missionary Society (1843), and the American Missionary Association (1846).

The revival of missionary enterprise on the continent of Europe was largely due to the strong interest taken in the subject by Frederick IV. of Denmark at the beginning of the eighteenth century. Having secured the co-operation of a German of the name of Francke, Ziegenbalg and Plutscho were in 1705 despatched to Tranquebar, on the Coromandel coast, in India, as the pioneers of the first Protestant mission to that peninsula. In 1714 the Danish Missionary College was founded in connection with that mission; but the missionaries still continued to be educated and the reports printed at Halle. Of the successors of Ziegenbalg and Plutscho the most distinguished was Chr. Fr. Schwartz. After the transference of the last of the Danish possessions in India to Britain in 1844 the Danish mission college ceased to direct any of the missions in India. The most important of their stations had previously been handed over to the Society for the Propagation of the Gospel. Besides this Danish mission there were other two started early in the eighteenth century, under the auspices of King Frederick. These were the mission of Hans Egede to Greenland, entered upon in 1721, and that of Thomas von Westen to Lapland. Both of these missionaries were Norwegians, and both were alike distinguished for their zeal and devotion to the cause they had undertaken. Zinzendorf, the founder of the missions of the Moravian or United Brethren, likewise derived his first incentive to undertake the work from Denmark. He resided for some time in Copenhagen, during the reign of Frederick, and it was on his return to Herrnhut in 1732 that the missionary society referred to was founded. In that year their first missionaries proceeded to the Isle of St. Thomas, in the West Indies, and about the same time they took up the mission work begun by Egede in Greenland. In course of time they extended their operations to all the West Indian Islands, as well as Labrador and other parts of North America, Surinam, Guinea, the Cape of Good Hope, the Nicobar Islands, and the banks of the Volga. The success of this society has been extraordinary, and is chiefly due to the method pursued by it. Instead of single missionaries it sends out whole colonies, which make settlements on the Moravian model, and while they support themselves by the labour of their own hands seek to gain converts among the natives as much by the civilizing influence which the spectacle of a well-ordered community exerts as by mild persuasion. Other societies have usually proceeded on the principle of sending out single missionaries to preach a doctrine wholly strange to the hearers; and it is only in later times that they have begun to use the school as the best preparation for the church. The Basel Missionary Society is now the most extensive on the Continent. It began in 1815 with a seminary for the education of missionaries, and in 1821 an independent society was established. The Rhenish Missionary Society, founded at Elberfeld-Barmen in 1828, is also influential. Both of these have a strictly evangelical though otherwise liberal constitution. The Evangelical Lutheran Missionary Association, founded in 1836 at Dresden, and since 1848 having its head-quarters at Leipzig, is more sectarian in its spirit. Among the other German societies are the North German Missionary Association, founded in 1836, from which the strict Lutheran section split off in 1849 and founded the Hermannsburg Union; and Gossner's Missionary Union, also founded in 1836. In Holland the principal society of the kind is the Netherlands Missionary Society, founded through the influence of Dr. Vanderkemp in 1797, although it did not commence operations till 1819. It was originally intended as an auxiliary to the London Missionary Society. The Dutch East Indian colonies form the principal field of its labours. There is a seminary in connection with it at Rotterdam. The Protestants in France established a missionary society at Paris in 1824. The Scandinavians have almost confined themselves in their missionary labours to Lapland, but the Norwegian Missionary Society, established in 1842, have a station among the Zulus in Africa. There is a seminary in connection with this society at Bergen. Missionaries have sometimes united with their main object an attention to the ethnography and geography, and also to the social and commercial relations of the country, which deserves the highest commendation—such as Loskiel in North America, the Danish missionary Monrad in West Africa, the Rev. W. Ellis in the South Sea, M. Huc in Thibet and China, and Dr. Livingstone in South Africa. The missionaries have also rendered great service to the study of languages, as, for example, Blumhardt (inspector of the missionary school at Basel), by his Comparative Observations upon the Connection between the Indian Languages, which are almost all related to the Sanscrit (Basel, 1819); Marsham, by his Clavis Sinica and other works containing the results of his study of Asiatic languages; and Morrison and Milne, two missionaries belonging to the London Missionary Society, who translated the Bible into Chinese.

MISSISSIPPI (Great Waters), the principal river of North America, and one of the largest rivers in the world. It lies wholly within the territory of the United States, rising in the state of Minnesota about lat. 47° and lon. 95° 54′ W., and falling into the Gulf of Mexico at the southern part of Louisiana, about lat. 29° N. and lon. 89° 30′ W. The head waters of this mighty stream are gathered by Itasca Lake, the *lac la Biche* of the French, a beautiful sheet of water, 7 or 8 miles in extent, lying among hills of diluvial formation, 1680 feet above sea-level, and 3160 miles from the outlet of the river. As it issues from this lake the Mississippi is 20 feet broad

and 2 feet deep. It first flows in a north direction through smaller lakes to Lake Travers, and leaving the lake near the place of entrance it turns to the east through Cass Lake to Little Lake Winnipeg, from which it takes that general south course which it afterwards keeps to its mouths, five in number, at the extremity of a long tongue of land which stretches 50 miles into the sea. It has formed a delta considerably larger than that of the Nile. The breadth of the river nowhere corresponds with its length. Its greatest width does not exceed half a mile, and there is no perceptible difference in its breadth for the 2000 miles forming the lower part of its course. The Mississippi is a rapid, desolating torrent, loaded with mud; its violent floods, from the melting of the snow in the high latitudes, sweep away whole forests, by which the navigation is rendered very dangerous, and the trees, being matted together in masses many yards thick, are carried down by the spring floods, and deposited over the delta and Gulf of Mexico for hundreds of square miles. The number of its tributaries of the first, second, and third class, are so numerous that it would be difficult even to name them. Amongst those of the first class are the Missouri, Arkansas, and Red River, joining it from the west, and the Ohio from the east. Before its junction with the Mississippi the Missouri is a stream much superior, both in length and volume, to that which it falls into, and has many affluents larger than the Rhine. It is sometimes considered the main stream of the Mississippi, in which case the length of the latter would be 4265 miles. The Mississippi is navigable for 2240 miles, and together with its tributaries drains an area of about a million and a quarter of square miles. No tides enter the Mississippi, but it is subject to annual inundations. Notwithstanding this, however, and other disadvantages, its trade and navigation are much greater than those on most rivers of the continents in the eastern hemisphere; 1500 steamers, besides a large fleet of flat-bottomed boats, navigating its waters. The most important towns on its banks from its source downwards, are St. Paul's, St. Louis, Memphis, Vicksburg, Natchez, and New Orleans.

MISSISSIPPI, one of the United States of North America; bounded north by Tennessee, east by Alabama, south by the Gulf of Mexico and Louisiana, and west by Louisiana and Arkansas; length, north to south, 337 miles; greatest breadth, 287 miles; area, 46,340 square miles. The Mississippi winds along its western frontiers for 330 miles. The coast line of the state on the south is from 70 to 80 miles. From the gulf northwards, for about 100 miles, the state of Mississippi is almost a dead flat, covered with pine forests, cedar swamps, prairies, and inundated marshes. More inland, especially towards the east, the ground rises, and becomes much broken by low hills, but nowhere becomes mountainous. Some ranges of bluffs follow the course of the Mississippi, at greater or shorter distances from its banks. This river receives the far larger part of the drainage, being augmented from within the state on its left bank by the Yazoo, and its tributary the Sunflower, the Big Black, the Homochitto, and many minor streams. The other rivers of consequence are the Pearl and Pascagoula, which proceed directly to the gulf; and the Tombigbee, which, after watering the north-east part of the state, quits it for Alabama. In the north, where the thermometer ranges from 26° to 94°, the climate is tolerably mild and agreeable; but in the south, below lat. 13°, it is both extremely hot and unhealthy. In the south-east, where the pine forests extend, the soil is light and comparatively barren, but large tracts of it are well adapted for pasture, whence it is sometimes called the 'cow country.' Tar and turpentine are obtained in considerable quantities from the pines. In the north-west, on the borders of the Yazoo, the soil is composed of rich black mould; and in the lower alluvial districts it is of remarkable fertility, but often suffers severely from inundation. The staple of the state is cotton, for the production of which it ranked first among the States in 1880. The other crops cultivated are chiefly Indian corn, bananas, sweet-potatoes, tobacco, and indigo. Manufactures and trade are comparatively of limited extent. Internal improvements have been made, and railroads have been constructed intersecting the country in various directions; total length of lines open at the end of 1882, 1309 miles. The state supports a public school system with separate schools for the white and coloured races, besides a state university and other schools of high grade. The legislature consists of a senate and house of representatives, the latter consisting of 120 members, chosen every second year; the former, of 40 members, elected for four years. The state sends seven members to the House of Representatives of the general Congress of the United States. The number of counties is seventy-four. The political capital is Jackson, on the Pearl river. The other principal towns are Vicksburg and Natchez. The state of Mississippi was first visited by Europeans about 1540. The first permanent settlement was made by some Frenchmen in 1716 at Natchez, then called Fort Rosalie. It was admitted into the Union as a separate state in 1817. Pop. in 1870, 827,922; in 1880, 1,131,592.

MISSISSIPPI SCHEME, a bubble scheme projected by the celebrated John Law at Paris in 1717. Law issued shares for a vast company to be called the Compagnie d'Occident, and to be engaged in the colonization and cultivation of the banks of the Mississippi. Reports skilfully spread as to gold and silver mines discovered in these parts raised in the people the hope of great gains. The company soon absorbed those of the Senegal and the East Indies, and took the new title Compagnie des Indes. Such were the hopes raised by this undertaking that the shares originally issued at 500 livres were sold at ten, twenty, thirty, and forty times their value. Law had promised to the regent that he would extinguish the public debt. To keep his word he required that the shares in this company should be paid for one-fourth in coin and three-fourths in *billets d'état* or public securities, which rapidly rose in value on account of the demand which was created for them. In October, 1719, the shares mounted as high as 20,000 francs. The street in which Law had his office was constantly crowded with applicants. People came from all parts of France, and even from foreign countries, in order to invest in the new company that made such brilliant promises. All classes abandoned themselves to the most reckless speculation. Enormous profits were made in a moment. The state took advantage of the popular frenzy to issue increased quantities of paper money, which was readily accepted by the public creditors and invested in shares of the Compagnie des Indes. This went on till the value of the paper money in circulation was more than three milliards, while the value of coined money was no more than 700 millions. Before this stage was reached Law himself, who had originated the idea of paper money, had endeavoured to check the issue, but his efforts were unavailing. A catastrophe was now inevitable. About the end of 1719 the ardour of many of the speculators began to be cooled. The more prudent began to sell out. In payment of their shares they received, of course, in great part, *billets d'état*, and with these bought gold, silver, diamonds, lands, or anything else having a real value. As the *billets* became depreciated such articles as tallow, soap, &c., were often bought at fabulous prices. Law

struggled desperately against the fall in the value of the shares, but all his devices to check their downward course were futile or had only a temporary success, and when the state finally declared that it would receive no further payments in paper, he perceived that all attempts to bolster up the scheme were in vain, and made his escape from France (Dec. 1720). The affairs of the company were wound up by the state acknowledging itself debtor to the creditors of the company to the amount of 1700 million livres. The public debt was augmented by 13 million livres of 'annual rentes.'

MISSOLONGHI, or MESOLONGI, a fortified town in Greece, capital of the nomarchy of Acarnania and Ætolia, on a marshy plain, covered with olive plantations, near the Gulf of Patras, 22 miles west of Lepanto. It is surrounded by a wall and ditch, and is further defended by forts on the two neighbouring islands, Wassalado and Anatolico; it is the see of an archbishop, the seat of a court of the first instance, and contains two important barracks and a Hellenic school. The town played an important part in the Greek war of Independence. It withstood several sieges by the Turks, but was taken and almost destroyed by Ibrahim Pasha in 1826. Near it, in 1823, a small Greek force under Marco Botzaris defeated a large Turkish army, but at the loss of their patriotic general. The town was restored to the Greeks in 1829. Lord Byron died here of fever, April 19, 1824; his heart is preserved in a splendid tomb erected by the Greeks in recognition of his exertions in their cause. Pop. (1879), 6324.

MISSOURI, a river of North America, which is formed in the Rocky Mountains, in Montana, by the junction of three branches, called Jefferson's, Madison's, and Gallatin's rivers, about lat. 45° 20′ N. and lon. 110° 30′ W. It winds circuitously along the base of the mountains, then east, till it reaches the north-west extremity of the territory of Dakotah. Here it begins to flow S.S.E. through that territory, which in the south-east it separates from Nebraska; it then forms the eastern boundary of Nebraska, separating it from Iowa and Missouri; separates for a short distance Kansas from Missouri, then strikes eastwards across the latter state, and joins the Mississippi on the right—more than doubling its volume—the latter river here forming the boundary between Illinois and Missouri. Its whole course, estimated from the highest point of Jefferson's River, is about 2500 miles. For the first 500 miles it presents scenes of almost unequalled grandeur, forcing its way through narrow gorges, which rise perpendicularly from the water's edge, and foaming over stupendous cataracts; but for the remaining 2000 miles there is no serious impediment to its free and uninterrupted navigation. Its affluents are very numerous on both banks, but by far the most important of them, the Yellowstone, the Nebraska or Platte, and the Kansas, fed by the same mountain ranges in which it has its own source, and each at least 600 miles in length, join it on its right bank. At its junction with the Mississippi the channel of the Missouri contracts, and does not exceed half a mile in width.

MISSOURI, one of the United States of North America, bounded north by Iowa; east by the Mississippi, which separates it chiefly from Illinois, but partly also from Kentucky and Tennessee; south by Arkansas; and west by Kansas and Nebraska, from which it is partly separated by the Missouri, and by the Indian Territory; area, 69,415 square miles. The surface, though nowhere so elevated as to become mountainous, is traversed by numerous hills and swelling ridges. In the south-east corner it is almost an alluvial flat. Among the most remarkable objects presented by the state are two hills, situated in St. François county, to the west of Fredericks-town, and composed of micaceous oxide of iron. Many other mineral treasures, including lead, copper, coal, and marble, are found in different districts. The most important rivers are the Mississippi and the Missouri, which here unite their accumulated waters. The former, as already mentioned, is continued without interruption along the whole of the east frontier; the latter, after bounding the state on the north-west, winds across it west to east, dividing it into two unequal portions, and receiving various navigable tributaries—the Lamine, Osage, and Gasconade on the right, and the Grand and Charlton on the left. The most fertile tract of country within the state is that which is situated within the fork of the Osage and the Missouri; but the whole land to the north of the latter river is equally remarkable for its picturesque scenery, and its agricultural and pastoral capabilities. The crops of Indian corn, oats, and wheat are unusually large; flax, hemp, and tobacco also form important staples; and immense numbers of cattle, sheep, and swine graze on the pastures, or subsist on the mast of the forests. The chief industries, which include flour-milling, iron-working, and pork-packing, have their main seat at St. Louis. There is a very large and increasing amount of internal traffic, for which the numerous navigable streams afford unwonted facilities. The length of the railways open at the end of 1882 was 4491 miles. Education has been well provided for by the state university; and several colleges, four normal schools, school of agriculture, school of mining and metallurgy, and the common schools. There are also many colleges, academies, and other educational institutions of a high order under the control of various religious denominations. The legislature consists of a senate and house of representatives, both chosen by popular vote, the former for four years, one-half retiring every second year, and the latter for two years. The state is divided into 114 counties; Jefferson City is the capital, but St. Louis is the commercial metropolis. Missouri, originally a portion of the territory of Louisiana, acquired by the United States in 1803, was admitted into the Union in 1821. In the civil war Missouri after much wavering threw in her lot with the Federals, and the state was the scene of several severe battles. Pop. in 1870, 1,721,295; in 1880, 2,168,380.

MISTLETOE (*Viscum album;* natural order LORANTHACEÆ), a European plant, growing parasitically on various trees, and celebrated on account of the religious purposes to which it was consecrated by the ancient Celtic nations of Europe, particularly when it was found growing on the oak. At the time of the winter solstice the Druids, who were the priests and magistrates of these people, went into the forests accompanied by the populace, and at the foot of an old oak bearing this plant built an altar, sacrificed victims, and performed various other religious rites and ceremonies. Some relics of this superstition still remain in France, and it is also the custom in Great Britain to hang up branches of this plant at Christmas, mixed with other evergreens. From the same cause for a long time it sustained a high reputation as a medicine. The plant is dichotomously branched, with sessile, oblong, entire, and opposite leaves, and small yellowish-green flowers; and in winter it is covered with small white berries. These berries are very glutinous, and contain a single seed. The roots of the mistletoe insinuate their fibres into the woody substance of trees, and the plant lives entirely at the expense of their sap, as the stems and leaves are incapable of absorbing moisture. All the attempts which have hitherto been made to raise this plant from the earth have failed. Though the

mistletoe is common enough on certain species of trees, it is very seldom found on the oak; it occurs mostly on apple-trees. Bird-lime is made from the berries and bark, which are boiled in water, beaten in a mortar, and washed; but this article is usually manufactured from the bark of the holly. The False Mistletoe of America belongs to an allied genus, and is named *Phoradendron flavescens*. It occurs from New Jersey to Illinois and southward on various deciduous-leaved trees.

MISTRAL, the Provençal name of a strong north-west wind, which, blowing from the Alps, forms one of the scourges of Provence and the valley of the Rhône. It blows with great violence during the winter and spring months, and frequently uproots trees and sweeps down houses in its fury. Its approach is indicated by a sudden change in the temperature from genial warmth to piercing cold; the air becomes purer and more invigorating, light fleecy clouds are seen far up in the sky, and at night the stars shine with extraordinary brightness.

MITE. Popularly this name is applied to many minute insects and arachnidans, which infest articles of food or dress, or which inhabit plants, or find a lodgment as parasites on the bodies of other animals. Scientifically the true *Acarina* or Mites form an order of the class Arachnida, which includes, besides, the spiders and scorpions. In the order Acarina are included the true mites, ticks, and water-mites. The most familiar mite is the common cheese or domestic mite (*Acarus domesticus*), which possesses a body of oval shape; eight legs—like all other arachnidans; and a masticatory mouth. The *Acarus destructor* is a species but too familiar to the naturalist, from its ravages among museum-specimens. The *Sarcoptes* (*Acarus*) *Scabiei*, or 'Itch-mite,' is interesting from a medical aspect, since this form causes the disgusting disease known as scabies or itch, and is found in the pustules which accompany and are symptomatic of that disease. The presence of these mites explains how itch may be communicated by touch; the mites being thus conveyed from the diseased to a healthy skin by mere contact. Sulphur, in the form of baths and ointment, is prescribed as the cure for this disorder, whilst cleanliness of body is the surest prophylactic. The *Demodex folliculorum* is a little mite inhabiting the little sacs or follicles of the human skin, and specially found in the neighbourhood of the nose. This latter form occurs almost without exception on the human individual, and is quite harmless in its effects and presence. The *Hydrachnidæ*, or Water-mites, possess legs in the form of natatory organs, provided with hairs. These latter are also furnished with two or four simple eyes or *ocelli*. The water-mites are generally parasitic upon aquatic insects, either throughout their entire existence, or at any rate during their young state. They further undergo a certain metamorphosis, the young form possessing at first only six legs and a long proboscis, and after a process of moulting developing the eight legs and the body characteristic of the adult mite. The *Hydrachna globatus*, or Common Water-mite, is the most familiar of these latter forms; and the other Hydrachnidan families comprise the Wood-mites (*Oribatidæ*), which live amongst vegetable matter; the Garden-mites (*Trombidiidæ*); the Spider-mites (*Gamasidæ*); and the Harvest Ticks (*Leptidæ*). Several species of salt-water mites have been described under the generic names of *Thalassarachna* and *Pontarachna*. The mites breathe either by the general surface of the body, or by tracheæ or air-tubes, like those of insects. The true ticks (Ixodes) possess suctorial mouths. (See IXODES). (For illustrations of mites see Pl. LIV.–LV. fig. 1–4; also Pl. LXIX. LXX. figs. 6, 6a.)

MITE, a small coin current in Palestine in the time of Christ. It seems to have been the smallest piece of money in circulation, being the half of the farthing, which was a coin of low value. Mite also denotes a small weight used by the moneyers. It is equal to the twentieth part of a grain, and divided into 24 doits.

MITFORD, MARY RUSSELL, a celebrated authoress, was the daughter of a physician at Alresford, Hampshire, and born there on 16th December, 1786. She was educated at a boarding-school at Chelsea, and early showed a turn for literature, publishing three volumes of poetry before she was twenty. These, and another poetical work, Watlington Hill, given to the world several years afterwards, were neither of much literary merit nor very successful; but better fortune attended Our Village, a series of prose sketches descriptive of English country life and scenery, drawn from the village of Three Mile Cross, near Reading, which had for a considerable time been her residence. They first appeared in the Lady's Magazine, where their freshness and originality attracted universal admiration, and were afterwards collected and published separately, and the series extended to five volumes, the last of which appeared in 1832. A subsequent work, Belford Regis, or Sketches of a Country Town, Reading forming the prototype, was nearly equally popular. Miss Mitford likewise made several attempts as a dramatist, and three of her dramas, Julian, The Foscari, and Rienzi, were produced on the stage with great success. Throughout the greater part of her life she suffered much both from ill health and pecuniary embarrassments, the latter caused in a great measure by the improvidence of her father, whom she both assisted by her pen and tended with filial devotion. In 1838 she was granted a pension by government, but neither this nor the increasing ill-health of her later years diminished her literary activity. She died at Swallowfield Cottage, near Reading, on 10th January, 1855. Her last works were Recollections of my Literary Life; a collected edition of her Dramatic Works; and Atherton, a novel in three vols., published in 1854.

MITFORD, WILLIAM, an eminent historical and philological writer, born in London February 10, 1744. He studied at Queen's College, Oxford, and then at the Middle Temple, but early quitted the profession of the law, and obtained a commission in the Hampshire militia, of which he became colonel. His early fondness for Greek led him to the study of the old historians of that country; and he was induced, partly through the advice of Gibbon, a fellow-officer in the same regiment, to undertake a History of Greece. The first volume appeared in 1784; the fifth and last, bringing the narrative down to the death of Alexander the Great, was published in 1818. The author intended to continue the work to the period of the Roman conquest, but was prevented by age and failing eyesight. With considerable critical acumen and diligent research he elucidated many obscure points, and until the appearance of the works of Thirlwall and Grote, his History was considered of the highest authority. His worst faults are a strong prejudice against democracy, which leads him to speak of the Athenians as a horde of treacherous miscreants, of Demosthenes as a malignant demagogue, and of Philip as a perfect statesman and warrior; a lack of philosophic reflection, dulness of narrative, and cumbrousness of style. The work was republished by his brother Lord Redesdale in 1828 (eight vols. 8vo, with an introduction). Besides his commission in the militia, Mitford held several other public offices, being verdurer of the New Forest, professor of ancient history in the

Royal Academy, and member of Parliament for three boroughs in succession from 1785 till 1818. He died in Hampshire, 8th February, 1827. Besides his principal work he published an Essay on the Harmony of Language (1774, 8vo); a Treatise on the Military Force, and particularly the Militia of this Kingdom (8vo); Observations on the History of Christianity (8vo); a work on Architecture, and another on the Corn-laws.

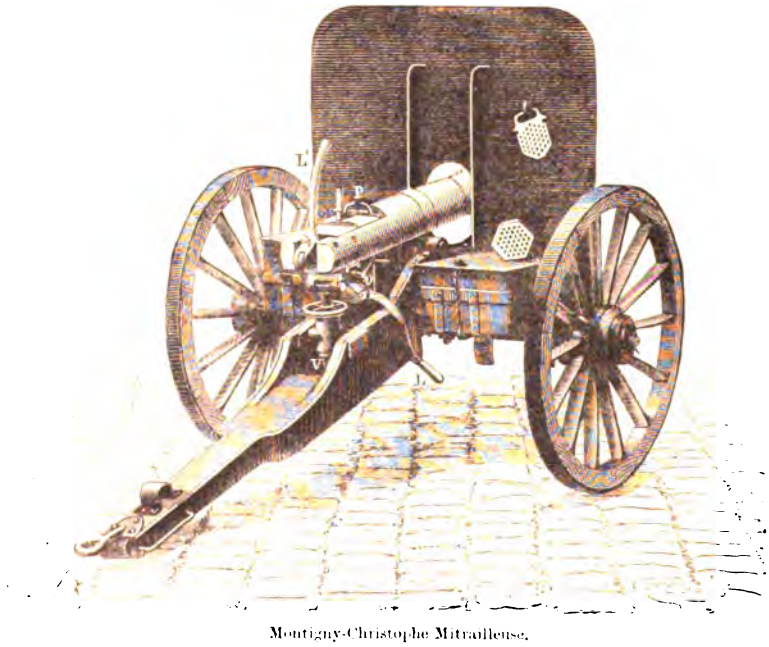
MITHRAS, the sun, or the genius of the sun, with the Persians, which was worshipped as a deity at a later period also in Rome. Mithras stands as a mediator between Ormuzd and the world. He is commonly represented as a handsome youth, wearing the Phrygian cap, tunic, and cloak, and kneeling on a bull, into whose throat he is plunging the sacrificial knife. The bull is at the same time attacked by a dog, a serpent, and a scorpion. Even during the reign of the Emperor Commodus it is said that human victims were offered up in the grottoes dedicated to his worship. According to Jerome the cultus of Mithras was suppressed by Gracchus, Præfect of Rome, in 377 A.D., but it found its way into all parts of Europe visited by the Roman legions. In Germany many tokens of its former existence are still to be found, as the monuments at Hedernheim, near Frankfort-on-the-Main, and other places.

MITHRIDATES, or MITHRADATES (from the Persian *Mithras*, the sun, and *datta*, given; hence signifying sun-given), the name of several kings of Pontus, among whom Mithridates VI., surnamed *Eupator* and *Dionysius*, but more generally known as the *Great*, was the most renowned. His father was murdered B.C. 120, and Mithridates ascended the throne at the age of thirteen years. His mother and his instructor plotted against his life; but he caused the former to be thrown into prison (although she had been made co-regent with him), where she died either of ill-treatment or by poison. When he became of age he travelled through Asia, partly to learn the customs, laws, manners, and languages of the inhabitants (and he is said to have spoken over twenty languages), and partly to examine the territories of his neighbours, of which he meditated the conquest. After an absence of three years he returned, and put to death his wife, who had been unfaithful, and had attempted to poison him. He then attacked Paphlagonia, and divided it with his ally the King of Bithynia. The Romans, who had declared the country free, threatened him with a war; but Mithridates was so little alarmed at this threat that he even possessed himself of Galatia, which had placed itself under the protection of Rome. He next directed his attention to Cappadocia; but fearing the power of Ariarathes, who was in possession of this country, he caused him to be assassinated. At the same time Nicomedes, king of Bithynia, entered Cappadocia, drove out the son of the murdered king, and married Laodice, the widow of Ariarathes and the sister of Mithridates. The latter then took the opportunity of re-entering Cappadocia, and replaced his nephew on the throne; but he soon compelled the young prince, by his dishonourable requisitions, to a declaration of war. They marched against each other with about equal forces. Mithridates then offered terms of peace, and invited the young prince to a conference, in which he killed him with a dagger in the sight of both armies. The Cappadocians were seized with terror, and Mithridates possessed himself of the country almost without opposition. Nicomedes now concerted with his wife the plan of suborning a young man to represent the third son of Ariarathes, and caused him to send to Rome to implore assistance. Mithridates took advantage of this fraud to endeavour to prove to the Romans that the young prince to whom he had given up Cappadocia (who was his own son, to whom he had given the name of Ariarathes) was the real son of Ariarathes. The Romans, having discovered this double fraud, took Cappadocia from Mithridates and Paphlagonia from Nicomedes; and the Cappadocians elected Ariobarzanes their king. Scarcely had Sulla, whose arms had elevated the latter to the throne, left Asia when Mithridates, with the assistance of Tigranes, king of Armenia, replaced his son upon the Cappadocian throne (B.C. 90). He also at the same time took Bithynia, and gave that country to his brother Socrates Christos. The Romans, however, soon restored things to their former condition. Mithridates then declared war against the Romans, and suddenly fell upon Cappadocia and Bithynia at the same time. His forces amounted to 250,000 foot, 50,000 horse, 130 chariots armed with scythes, and 400 ships. Those of the Romans, with the Bithynian auxiliaries, were not much inferior, and were commanded by Cassius, Aquilius, and Oppius. Mithridates was at first successful. He not only defeated Nicomedes, but also Aquilius, conquered Bithynia, and captured a great part of the Roman fleet. Phrygia, Caria, Mysia, Lycia, Pamphylia, Paphlagonia, and all the country as far as Ionia, fell into his hands, and hailed him as the saviour of Asia. The Roman generals Oppius and Aquilius were given up to him as prisoners; and he caused melted gold to be poured down the throat of the latter, in derision of the avarice of the Romans. The free cities of Asia, Magnesia, Mitylene, Ephesus, &c., opened their gates to the victor. He caused all the Roman citizens in Asia Minor to be put to death. Dionysius and Plutarch give the number of those who perished at 150,000; Appian at 80,000. Mithridates next conquered the islands of the Ægean Sea, except Rhodes. From Pergamus he sent his general Archelaus with 120,000 men to Greece. Athens fell by treachery into his hands, and various other places were taken; while another of his generals, Metrophanes, ravaged Eubœa. On the news of the defeat of the latter Mithridates sent his son Ariarathes with a powerful army into Macedonia, which, with Thrace, was speedily conquered. His arms were everywhere victorious, until at length the report that he threatened Italy itself led the Romans to adopt more decisive measures. Sulla embarked for Greece, reduced Athens by famine, destroyed the army of Archelaus in a bloody contest at Chæronea, and emancipated all Greece by two victories in Bœotia (B.C. 86). Fimbria reduced Asia Minor, and besieged Mithridates himself in the fortress of Pitane, who finally fled to his ships. The Pontic fleet was also twice defeated by Lucullus. Mithridates now sued for peace, which Sulla granted under severe conditions, B.C. 84. He was limited to his hereditary Kingdom of Pontus, and compelled to deliver into the hands of the Romans seventy ships of war manned, and to pay 2000 talents. Sulla had scarcely left Asia before Mithridates attacked Colchis, and refused to fulfil the conditions of the peace. The Roman general Murena, who entered and ravaged Pontus, was defeated, and was ordered by Sulla to cease hostilities. Soon after the death of Sulla (B.C. 78) Mithridates determined to recover the countries he had ceded, and a new war with Rome broke out. The consuls Lucullus and Cotta went against the king, the latter as commander of the fleet, and the former as general of the land forces. Cotta was unsuccessful; but Lucullus gained so many advantages that Mithridates found himself compelled to flee to his son-in-law Tigranes, king of Armenia. Lucullus, who had in the meantime transformed Pontus into a Roman province, demanded the sur-

brother of Mithridates, with Tigranes refused to aid him against the Romans, and the latter [illegible] into Armenia. [illegible] with Mithridates, stirred up against him the Parthians, and [illegible] to Armenia. Mithridates fled with a few followers to the Armenian Mountains, from whence with Tigranes. In the meantime the consul Manius Aquilius Gaul had been [illegible] in the power of Lucullus. The latter took advantage of the [illegible] to this country, and reduced the greater part of Pontus, Bithynia, Cappadocia, and Armenia Minor. Pompey then appeared at the head of the Roman army. He besieged Mithridates in his capital far from the Euxine Sea. The king escaped, but was pursued, attacked in a defile, and totally routed at Nicopolis. Out of his escort with only seven horse. Tigranes would not receive him, and he fled to Colchis. Pompey followed him, and he took refuge in the dominions of a Scythian prince. He was now thought to have perished, until he suddenly reappeared in Pontus, collected troops, and the war broke out afresh. The forces of the Romans in Pontus was small, and Mithridates made some progress. The inhabitants, however, soon revolted from him, and his neighbours refused him their assistance; nevertheless his unbending spirit rejected the proposals of peace made by Pompey. He now retired to Bosporus the Crimea, and formed the bold project of penetrating into Gaul at the head of his army, and marching with the inhabitants into Italy; but an insurrection, headed by his son Pharnaces, broke out in his army. Unable to reduce the rebels to their duty, Mithridates threw himself upon his sword, that he might not fall alive into the hands of the Romans (B.C. 63).

MITRAILLEUSE. This weapon came in shortly before the Franco-German war in 1870, in which war its powers were first displayed. It may be briefly described as a number of rifle barrels fixed or bound together [illegible] and mounted on a small gun carriage like a field-piece. Plungers and springs are fixed in connection with the breech ends of the barrels that they may be fired *in succession with great rapidity*. On this depends two main elements of the power of the weapon—its absence of recoil, and its capability of pouring a stream of missiles on any given point within its range. The rate of discharge being such as to preclude the possibility of laying the piece between each round, it is obvious that any sensible recoil would render it comparatively useless. Mitrailleuses have been frequently made to fire balls of weight greatly exceeding that of ordinary rifle balls. As, however, the number of barrels has in such a case to be decreased, it has been found best for general purposes to adhere to nearly the infantry rifle barrel. This being so, it follows that it cannot invade the province of either artillery or infantry and engage them in the open, for it is liable to be helplessly crushed by artillery firing at a range beyond its reach, or to be disabled and captured by infantry advancing on it in skirmishing in extended order. It is, however, admirable as a means of pouring a stream of musketry fire on to some fixed point such as a breach or bridge, and in this way it made great havoc in the above-mentioned war.

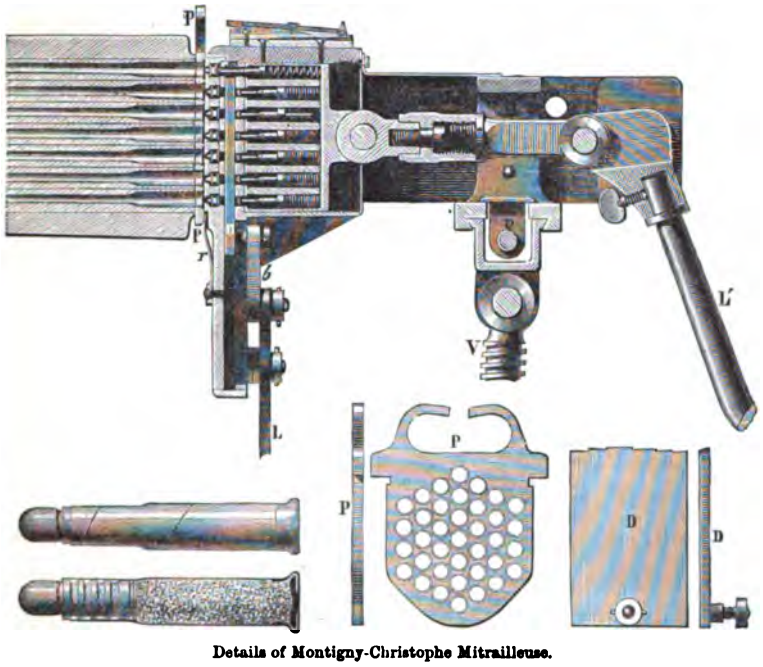
Of mitrailleuses there are two distinct kinds, one of which is represented by the annexed cuts of the Montigny-Christophe Mitrailleuse, the other by the Gatling arm. In the former the action may be termed *intermittent*, the loading and firing being *alternate* or *successive* operations. It consists essentially of two portions, the fixed portion, or that formed by the barrels, and the movable portion, containing the plungers and springs, and capable of being advanced to or withdrawn from the breech ends of the barrels by the action of the lever L'. The movable portion



Montigny-Christophe Mitrailleuse.

being drawn back, a plate (P) containing thirty-seven cartridges is let down behind the barrels, each of which receives a cartridge. The trigger plate D being then placed in position behind the cartridge-plate by means of the lever L, by moving the lever L' the springs are compressed so that the strikers

pressed against the trigger-plate. Firing is effected by the forcing down of the lever L, which releases in succession the thirty-seven pistons and springs, firing the cartridges with a rapidity depending only on its rate of movement. The second cut shows a longitudinal section of the barrels and plungers in the movements



Details of Montigny-Christophe Mitrailleuse.

of firing, but without cartridges. The top plunger has sprung forward, the remainder are still held back. v is a screw by which the gun may be raised or lowered: r is one that gives lateral motion.

In the Gatling the barrels revolve, being fed in turn as they pass a certain point by cartridges from a hopper placed above, and changed from time to time when exhausted of its supply. In this arm the loading and firing is therefore *simultaneous* and the discharge *continuous*. For the British service the Gatling has been preferred. In the trial at Shoeburyness the Gatling of ·42 inch calibre on one occasion discharged 657 rounds in two minutes. The Montigny of ·577 inch calibre, as its maximum rate, delivered 370 rounds in the same time.

A stream of rifle bullets well directed on any given point must effectually prevent the passage of troops. For purposes of defence, then, the mitrailleuse is singularly valuable. Its light weight and its absence of recoil enable it to be brought into action in nooks and corners where a gun would not find room. The ditch behind a hedge in the corner of a road, such as may frequently be found in England, enabling it to fire along the road, would be often a suitable position; and until dismounted by artillery, or surrounded and captured, the mitrailleuse would no doubt make any advance along the road impossible. The bullets may be made to carry close or with a little dispersion. Certain Prussian officers visiting Woolwich the year subsequent to the French war reported that one German soldier, *then living*, had been struck by thirty-two mitrailleuse bullets. This clearly did not answer the purpose of the enemy: not because the man lived, for in war the object is to disable, not to kill, but rather because no useful purpose was answered by striking him repeatedly. It would have been desirable to have distributed these wounds to other Germans.

In the first figure may be seen an adjunct that has been adopted by some powers, but not by Britain as yet, namely, an iron shield. Such a guard may easily be made bullet-proof; in fact sheet-iron shields have been tried and approved at Chatham to cover men digging open saps in siege-works. The weight of the carriage is greatly increased by it, and it is found in some cases inconvenient. The shield is in some designs made to fold up by means of hinges. In the case of a breach where the enemy, though in numbers in front, are unable to fire obliquely on it, there can be no doubt that a mitrailleuse suddenly brought up may be made much more formidable by such a protection.

MITRAL VALVE. This valvular structure, or *bicuspid valve*, as it is sometimes termed, guards the *auriculo-ventricular orifice* of the left side—that is, is situated between the left auricle and ventricle—of the heart. It has been called *mitral* valve from a rough resemblance which it presents to the general form of a bishop's mitre; and the name *bicuspid* has been given to it from its consisting of two pointed cusps or projections. These flaps or cusps are membranous in character, and are attached by their bases to the edges of the opening between the auricle and ventricle, while the apices or free edges of the cusps project into the ventricle. The function of the mitral valve is to prevent regurgitation of the blood into the left auricle; and it is brought into action when the left ventricle contracts for the purpose of forcing the blood into the *aorta* or great artery, for distribution throughout the body.

MITRE (Greek and Latin, *mitra*, a head-band) a sacerdotal ornament worn on the head by bishops and certain abbots on solemn occasions, being a sort of cap pointed and cleft at top. The pope uses four different mitres (or tiaras, as they are called in this case), which are more or less rich, adorned according

to the nature of the festivals on which they are assumed. The cardinals formerly wore mitres, and some canons of cathedrals in Roman Catholic countries have the privilege of wearing the mitre, which is also borne by several families of distinction in Germany as their crest. The original meaning of *mitra*, as it appears in Homer, is a band or belt worn by warriors to protect the lower part of the body. Later writers used the word to signify a head-band worn by the Grecian females, and more particularly to indicate what is now commonly called the Phrygian cap. It is not known when the episcopal mitre, in its present forms, came into use. Its twofold point is supposed to symbolize the cloven tongues as of fire in the form of which the Holy Ghost was imparted to the apostles. The mitre is very frequently met with in early Christian manuscripts, in illuminated missals, and upon the oldest ecclesiastical monuments; this, however, might be expected, since its usage has always been principally ecclesiastical. A statue of St. Peter erected in the seventh century bears this mark of distinction, in the shape of a round, high, and pyramidal mitre, such as those worn by each of the popes since. Perhaps this statue offers one of the earliest instances of its usage in the Christian churches. It was often an ornament of considerable expense; from a MS. in the British Museum we learn that in 1288 Archbishop Pocheham's new mitre cost £173, 4*s.* 1*d.* Since the Reformation the mitre forms no part of the costume of an English Church dignitary.

MITSCHERLICH, Eilhard, a celebrated German chemist, born at Neuende (Oldenburg), 7th Jan. 1794. In 1811 he went to the University of Heidelberg, where he devoted himself to the study of history and philosophy; thence he went to Paris and afterwards to Gottingen, where he set about acquiring a knowledge of the oriental languages. In 1818 he went to reside at Berlin, and turned his attention to the natural sciences, more particularly to chemistry. His observations on the striking similarity between the crystalline form and the chemical composition of the phosphates and arseniates, led him to the discovery of the law of isomorphism (which see). The eminent chemist Berzelius, on a visit made to Berlin in August, 1819, conceived so high an idea of the young chemist that he invited him to Stockholm, where he studied for two years. On his return to Berlin in November, 1821, he was elected a member of the Academy of Sciences, and was appointed professor extraordinary in the university. One of his earliest discoveries after this appointment was that of the double crystalline form of sulphur, the first observed case of dimorphism. The winter of 1823–24 he spent with Berthier in Paris, and found that, by fusing the mineral constituents together in proper proportions, diopside, idocrase, and garnet were produced. In 1825 he became ordinary professor of chemistry in Berlin, a position he held until his death in 1863. His principal work is his Lehrbuch der Chemie, begun in 1829 and ended in 1840, and which has passed through several editions. He received the gold medal of the Royal Society of London for his discovery of isomorphism, and was elected an honorary member of almost all the important scientific societies of Europe.

MITTAU, or Mitau (Lettish, *Jelgava*), a town in Russia, capital of the government of Courland, in a low, flat, and sandy district on the Aa, over which is a bridge of boats, 25 miles south-west of Riga. It covers a very large space, of which, however, a consortion is occupied by gardens, and is on the indifferently built, with houses chiefly of l green or reddish-brown; many of the w and crooked, but some also wide, straight, and regular. The most interesting building is the castle, the residence of the old dukes of Courland, restored and completed by Marshal Biron. Among the other buildings may be mentioned four churches, three synagogues, a museum, a library, an observatory, a gymnasium, an hospital, an orphan and a lunatic asylum, a casino, and a theatre capable of containing 2000 spectators. Its manufactures, which are of little moment, include, linen, hosiery, soap, and leather: and its trade is very limited. The town was founded in 1271 by the grand-master of the Teutonic knights, and was annexed to Russia in 1795. Pop. 23,347.

MITTIMUS, a writ by which records are transferred from one court to another. The precept directed to a jailer, under the hand and seal of a justice of the peace, for the receiving and safe keeping of a felon, or other offender, by him committed to jail, is also called a *mittimus*.

MITTWEIDA, a town in Saxony, in the circle of Zwickau, situated on the left bank of the Zschoppau, 36 miles south-east of Leipzig. It has a handsome church, a town-school, a house of correction, and manufactures of linen, cotton, flannel, sail-cloth, parchment, and leather; a tile-work, two bleach-fields, spinning and other mills. Pop. 9218.

MITYLENE. See Lesbos.

MIXTURE, Freezing. See Freezing Mixture.

MIZZEN MAST, the mast which supports all the after sails. See Ship.

MNEMONICS. See Memory.

MNEMOSYNE (Greek, Memory), in the Grecian mythology, daughter of Uranus (*Cœlus*, Heaven) and Gaia (*Terra*, Earth), and by Zeus the mother of the nine Muses.

MOA, the native New Zealand name for a gigantic bird now extinct, which the natives describe as being of a fierce disposition, and which palæontologists are inclined to accept as the *Dinornis*, its fossil remains being found in New Zealand in deposits of recent age. The Maori traditions recount the wars of extermination which their early ancestors waged with the *Moa;* and the natives profess to show the spot where the last Moa was killed. It has been suggested that the Moa—or Dinornis—may yet exist in the unexplored and less accessible parts of these islands. The Dinornis was a wingless bird, and must have stood at least 14 feet in height; and the traditions of the natives appear thus to be strengthened in a singularly circumstantial manner by the researches of the palæontologist.

MOAB, the land of the Moabites, an Arabian tribe dwelling in the mountainous region east of the Dead Sea, from Zoar to the river Arnon, between the Midianites, Edomites, and Amorites. According to the Mosaic account (Gen. xix. 30) the Moabites were descended from Moab, the son of Lot by his eldest daughter. In the time of the judges they were for eighteen years masters of the Hebrews, but in the time of David were rendered tributaries to them. After the Babylonish captivity they lost their separate national existence. Their principal leaders mentioned in Scripture are Balak and Eglon; their idols were Peor and Chemosh.

MOABITE STONE, a monument of black basaltic granite, about 3 feet 5 inches high, and 1 foot 9 inches wide and thick, with rounded top but square base, on which there is an inscription of thirty-four lines in Hebrew-Phœnician characters, discovered in 1868 at Dhiban in the ancient Moab. An attempt made to purchase it led to a quarrel among the Arabs of the district, and the stone was destroyed partially by being heated with fire and then by throwing water upon it, which caused it to break into three large and several small pieces. The larger pieces

were secured for the Louvre by M. Clermont Ganneau, an official connected with the French embassy at Constantinople, who was also fortunate in obtaining a paper impression of the inscription before the stone was broken. The inscription dates about 900 B.C., and is the oldest known in the Hebrew-Phœnician form of writing. It was erected by Mesha, king of Moab, and is a record of his wars with Omri, king of Israel, and his successors. Mesha appears to have fortified Baal-meon, made a successful attack on Kirjath-aim, taken Asharoth, putting all its inhabitants to the sword, and repeopling it from Siran and Zereth-Shachar. He afterwards captured Nebo, slew 7000 men, and devoted the women, together with the sacred vessels of Jehovah, to Ashtaroth and Chemosh. He defeated the King of Israel near his fortified city of Jahaz, which was taken and garrisoned by the Moabites. Mesha restored Kerets, rebuilt Aroer, Beth Bamoth, and Bezor, Beth Gamul, Beth Diblathaim, and Beth Baal-meon. The narrative also treats of Mesha's wars against the Edomites. See Ganneau's Stèle de Mesa (4to, Paris, 1870) and Ginsburg's The Moabite Stone (4to, London, 1870).

MOALLAKAT (that is, the hung up), seven Arabian poems of the time immediately preceding Mohammed, which, on account of their excellence, were suspended in public in the temple at Mecca. An English translation with arguments, and the Arabic text, was published by Sir W. Jones (London, 1783). See ARABIAN LITERATURE.

MOAT, or DITCH, in fortification, a deep trench dug round the rampart of a fortified place to prevent surprises. The brink of the moat next the rampart is called the *scarp*, and the opposite one the *counterscarp*. A dry moat round a large place, with a strong garrison, is preferable to one full of water; because the passage may be disputed inch by inch, and the besiegers, when lodged in it, are continually exposed to the bombs, grenades, and other fireworks which are thrown incessantly from the rampart into their works. The deepest and broadest moats are accounted the best; but a deep one is preferable to a broad one; the ordinary breadth is about 20 feet, and the depth about 16.

MOBILE, a city and port of the United States, in Alabama, on the right bank of the Mobile, at its entrance into Mobile Bay. It is built on a beautiful and extensive plain, 15 feet above the level of the tides, and open to refreshing breezes from the bay. The principal public buildings are the courthouse, jail, custom-house, city hospital, United States naval hospital, several churches, a synagogue, a theatre, and an amphitheatre. There is an efficient system of tramways. It is defended by a fort on a long, low, sandy point at the mouth of the bay, and 30 miles below the city. Next to New Orleans Mobile is the greatest cotton mart of the South. It is, in fact, the entrepot for the whole of Alabama, and for parts of Georgia and Mississippi. It has also a large coasting trade, principally with ports on the Atlantic. A breakwater was built in 1876 which has greatly increased the safety of the harbour, and a wide channel is now being cut right through the bay to a depth of 23 feet, to allow the approach of large vessels. Pop. in 1880, 29,132.

MOBILE, a river of Alabama, formed by the union of the Alabama and the Tombigbee, which unite about 45 miles above the town of Mobile. It enters Mobile Bay by two mouths. The Alabama is the eastern branch. The lands on the borders of the Mobile, Tombigbee, and Alabama are excellent, and produce great quantities of cotton.

MOBILE, GARDE. See GARDE NATIONALE MOBILE.

MOBILIER, CRÉDIT, a joint-stock company upon the limited liability principle, founded in Paris under the sanction of the government, by a decree dated 18th November, 1852, with a capital of 60,000,000 francs, divided into shares of 500 francs. The society was constituted for ninety-nine years, and was intended specially to promote industrial undertakings of all kinds, particularly railways, canals, mines, gas, water, and other public works. The name was intended as a contrast to the Sociétés de Crédit Foncier, which advance money on real or *immovable* property, whereas the Crédit Mobilier lent upon *movable* property. It was authorized to subscribe for or to acquire public securities, as well as shares in industrial enterprises; to issue its own bonds for an amount equal to its subscriptions and purchases, and after the complete issue of the original capital of 60,000,000 francs to issue its bonds equal to ten times this amount. By the terms of its charter the society had unlimited power to engage in the most extensive operations, the only restriction being not to sell in advance public securities, nor to buy them on time. In 1854 it subscribed largely to the government loan on account of the Russian war, to the Grand Central Railway Company, to the General Omnibus Company of Paris, the General Marine Company, &c., and the dividend for the year was 12 per cent. In 1855 it lent 625,000,000 francs to the government, besides other vast operations, and paid a dividend of 40 per cent., the highest ever reached. In 1856 the dividend fell to 23 per cent., in 1857 and 1858 to 5; it gradually rose again, and in 1862 and 1863 ran up to 25 per cent., after which it again fell, and in 1867 the shareholders touched neither dividend nor interest, and the shares fell to 140 francs. It was then found necessary to wind up the society and institute legal proceedings against the brothers Pereire, who had all along been the moving spirits of the society. It had degenerated into a huge association of mere gambling speculators, and authorities doubt very much whether the benefits of its first years have not been swallowed up by the ruin it inflicted upon many in its last. Numerous other societies of the same nature were formed in Germany, Austria, Switzerland, and Belgium, the majority of which had a shorter career than their prototype. Others, however, seem to have struck deep root, and flourish vigorously.

MOCHA, or MOKHA, an important Arabian seaport, on the Red Sea, about 40 miles within the Strait of Báb-el-Mandeb. It lies in a bay formed by two low points projecting into the sea, about 3 miles asunder. On each of these points is a castle with a few guns. Between them extends the sea-wall, which protects the town, and allows access to it only by a single gate, opposite to which is a well-constructed stone pier or jetty, approachable by small vessels. The roadstead for large vessels is 3 or 4 miles from the shore. The town extends north to south about 1½ mile along the shore, and seen from the exterior has a pleasing, impressive appearance. The houses next the sea are well built of stone, and lofty, with stucco ornaments, and brilliantly white. Beyond these are seen ten mosques, four of them large, and one of great magnitude. Mocha is the chief port and emporium in the dominions of the Imám of Sana, and owes its importance, and perhaps its origin, to the coffee trade, which has been always centered in it. The country round Mocha is an arid, sterile plain, without fresh water, a supply of which for the use of the town is led by an aqueduct from the village of Musa, 20 miles distant, at the foot of the hills. The coffee, therefore, which bears the name of Mocha is not produced in the immediate neighbourhood of this town but on the wooded hills of the interior, and

particularly near the town of Beit-el-Fakih, where the best kinds are collected, and thence consigned to the merchants at Mocha. Pop. 5000.

MOCKING-BIRD (*Mimus* (*Orpheus*) *polyglottus*). This bird is included in the Dentirostral section of the order Insessores (which see) or Perching Birds, and forms a genus of the Thrush family (Turdinæ). The plumage is not at all brilliant, being of a general cinereous colour: but what this bird lacks in beauty of plumage, is fully compensated for by its amazing facility of voice and song. It inhabits North America chiefly, being a constant resident of the Southern States, and but rare and migratory in the northern parts of the continent. It is also found in the West Indian Islands and in Brazil. The nest is built generally in a bush or thick tree, and according to Wilson is constructed of a variety of materials, such as dried twigs, weeds, pieces of straw and hay, and is lined with a layer of fibrous roots. The time of nest-building appears to vary in different localities. The eggs number four or five, and are of an ashy-blue colour, marked with brown patches. The period of incubation is about fourteen days, and two broods are produced annually; but a third brood may be hatched if the former ones have been injured or stolen. The female is exceedingly careful of her nest, and if disturbed may desert it altogether; whilst any intending enemies, such as cats, snakes, &c., are repulsed with great vigour and frequent success. The young, when taken from the nest for domestication, should be removed at an early period; or if taken later, they are generally removed by means of trap-door cages. The ordinary song-notes of the mocking-birds are clear, bold, and varied. They sing during the night, like the nightingales, and appear to begin their song with the rising moon. The imitative notes of these birds are, however, still more varied than their natural tones. They mimic with perfect success the songs of all their feathered neighbours and rivals, and with such exactitude as to deceive the ear of the most experienced sportsman, who fancies he hears the notes of certain birds which may be quite foreign to the locality. The cackling of hens and crowing of cocks may also be imitated; and when kept in confinement all the sounds of the household are certain to be accurately reproduced. The mewing of cats, the barking of dogs, the cry of an injured chicken, and the screech of the hawk, are all exactly imitated. The Ferruginous Mocking-bird (*Orpheus rufus*) is another familiar species. This latter bird is familiarly known in North America as the Brown Thrush or Thrasher, but it does not appear to equal its more celebrated neighbour in the powers of its song.

MODALITY. Kant uses this word for that *category* (see KANT) which determines the relation of all the ideas of the judgment to our understanding. The logical modality of Kant is, therefore, the manner in which the understanding conceives the connection and relation of ideas in a judgment; whether we leave something undecided, as in problematical judgments, or give the thing as true, as in assertory judgments, or are obliged to consider a certain connection of ideas to be true, as in apodictical judgments.

MODE. See GREGORIAN TONES.

MODEL, an original of any kind proposed for copy or imitation. It is used in building for an artificial pattern formed in stone or wood, or, as is most commonly the case, in plaster, with all due parts and proportions, for the more correct execution of some great work, and to afford an idea of the effect to be produced. Models in imitation of any natural or artificial substance are usually made by means of moulds of plaster of Paris. In painting this is the name given to a man or woman who is procured to exhibit him or herself in the requisite costume, or in a state of nudity, for the advantage of the students. These models are provided in all academies and schools for painting, and the students who have acquired a tolerable use of the pencil are introduced to this kind of study. By this means the folding and fall of the drapery, the details and proportions of the human shape, the play of the muscles, the varieties of expression, &c., are displayed and inculcated far better than by any course of lectures or any study of former works. It is desirable that the living models used in an academy, or even in a private painting-room, should be changed as frequently as possible, or the student is in danger of falling into mannerism. Millin speaks of a model of the name of Deschamps, who did duty in this way upwards of forty years in the Academy at Paris, and comments on the facility with which this person's form and features might be recognized, in every variety of subject or of expression, in the paintings of the students of that period. In sculpture a model implies a figure made of wax or terra cotta, or any other malleable substance, which the artist moulds to guide him in fashioning his work as the painter first makes a sketch, or the architect a design. When a model of any existing object is to be taken the original is first to be greased, in order to prevent the plaster from sticking to it, and then to be placed on a smooth table, previously greased, or covered with a cloth, to guard against the same accident; then surround the original with a frame or ridge of glazier's putty at such a distance as will admit of the plaster resting upon the table on every side of the subject for about an inch, or as much as may be thought sufficient to give the proper degree of strength to the mould. An adequate quantity of plaster is then to be poured as uniformly as possible over the whole substance, until it is everywhere covered to such a thickness as to give a proper substance to the mould, which may vary in proportion to the size. The whole must then be allowed to continue in this way till the plaster shall have attained its firmness, when the frame being removed, the mould may be inverted and the subject taken from it; and when the plaster is thoroughly dry it should be well seasoned.

MODELLING. See SCULPTURE.

MODENA, formerly an independent duchy in the north of Italy, in a fruitful plain of Lombardy, watered by the Panaro, and bordering on Tuscany, Lucca, Bologna, Mantua, and Parma; area, 2340 square miles; pop. over 604,000. It now forms a part of the Kingdom of Italy, and is divided into the provinces of Modena, Massa-Carrara, and Reggio. The territory is fertile and well cultivated, the climate in general temperate and healthy, and the principal productions corn, rice, fruits, wine, oil, silk, honey, iron, marble, &c. Previous to the year 1859 Modena was governed by an Austrian branch of the house of Este. (See ESTE.) In 1653 Correggio was added to the duchy by grant of the Emperor of Germany; Mirandola in 1710; and Novellara in 1737. Hercules III. (died in 1803) married the heiress of the Duchy of Massa-Carrara, and left an only daughter, who was married to Ferdinand, arch-duke of Austria, brother of Leopold II. In 1796 the French took possession of the country, and it was included in the Cisalpine Republic, and afterwards in the Kingdom of Italy. By the Treaty of Vienna, in 1815, Modena was bestowed on Francis, grandson of Hercules III., and son of Ferdinand, archduke of Austria, who assumed the title of Francis IV., whilst the Duchy of Massa-Carrara was restored, along with the territory of Lunigiana, to his mother Maria-Beatrice, of Este. These subsequently devolved on her son on her death in 1829. Like most of the dynasties restored on the

fall of Napoleon, the Modenese government adopted an arbitrary and coercive policy in administration, and though somewhat checked for a while by the popular reactions in 1821 and 1831, it was only to be resumed with circumstances of the greatest violence and cruelty on the suppression of the liberal party. Francis IV. died in 1846, and was succeeded by his son, Francis Ferdinand V., whose sway was at first characterized by greater mildness than that of his father. To quell the agitation, however, for political reform in 1847, he too resorted to arbitrary and persecuting measures, and in 1848 entered, along with the Duke of Parma, into a treaty with Austria, whereby that power was authorized to occupy their territories in the event of any political insurrection. In the course of that year Francis twice quitted his capital, but finally returned to it in 1849. His subsequent proceedings were on the whole mild and reformatory, but the old despotic maxims still prevailed, and the principal reliance of government rested on the maintenance of a large military force. In 1850 the Jesuits were reinstated in all their former possessions and privileges. The support afforded by the French emperor, Louis Napoleon, to Sardinia, and his implied favourable views to the cause of Italian independence, infused in 1859 a fresh spirit of resistance to tyranny in the minds of the Modenese, as in those of the other states of Central Italy. In this year the duke quitted his dominions, which were placed under the government of M. Buoncompagni, who was appointed interim-regent of Central Italy. When the Italian Kingdom was afterwards consolidated Modena proper was formed into a separate province, and in 1881 had a pop. of 289,247.

MODENA (anciently, *Mutina*), a town in Italy, capital of the province of its own name, pleasantly situated in a somewhat low but fertile plain, between the Secchia and the Panaro. It is walled, built with great regularity, and has spacious streets, generally lined with porticoes. It consists of three principal parts—the citadel, which, with its esplanade, occupies about a third of the whole; the old town, and the new town. The most remarkable edifices and establishments are the cathedral, a fine specimen of Romanesque, adorned in front with numerous curious sculptures; the church of San Francisco, a handsome Gothic structure, containing a fine group of the Descent from the Cross, in *terra cotta*, by Begarelli; several other churches; the ducal palace, begun in the seventeenth century, but enlarged by numerous modern additions, and now forming a splendid structure, with a large collection of paintings, several of them by the first masters; a museum, containing curious medieval sculptures, and a library rich in MSS.; the public library, of 100,000 vols.; the theatre, the baths, the colleges of law and medicine, several other important educational institutions, and charitable endowments. The manufactures, which have lost much of the importance they once possessed, consist chiefly of silk goods, silk twist, woollen and hempen cloths, leather, and glass; the trade—notwithstanding the advantage of a canal which traverses the town, carries barges of 30 tons, and communicates with the Panaro—is very insignificant. Modena is the see of a bishop, and possesses many important public offices, as well as societies, literary, scientific, and artistic. It existed under the Etruscans, and rose to such splendour under the Romans as called forth a eulogy from Cicero. It afterwards was repeatedly sacked by the northern invaders, whose ravages have left few vestiges of its ancient grandeur. Pop. on the 31st December, 1881, 31,053.

MODICA, a town of Sicily, in the province of Syracuse, and 31 miles W.S.W. of the city of that name, capital of the district of its own name, in a narrow, craggy valley, on the right bank of the Scicli. It is ill built, but has a large square, and some handsome mansions; a castle, and several churches and convents. It exports grain, oil, wine, and cheese. The valley of Ipsica, in the vicinity, is interesting from the number of troglodyte caves it contains. Pop. (1881), 38,390.

MODILLION, in architecture, a projecting bracket, sometimes square on the profile, but oftener scroll-shaped, placed under the corona of the Corinthian and Composite orders, and sometimes of the Roman Ionic.

MODULATION, in music, is the act of moving through the sounds in the harmony of any particular key to those of another, or the transition from one key to another. The simplest form is the change from a given key to one nearly related to it, namely, its fifth (dominant), fourth (subdominant), its relative minor, or the relative minor of its fifth. Modulation into the dominant is effected by introducing in any of the parts (rarely in the bass, however) the sharp fourth, which becomes the seventh of the new key; thus, in the key of C, F would be sharpened to effect the transition into the key of G; to pass from that key into that of B it would be necessary to sharpen the C, and so on. In modulating into the subdominant the flat seventh is used, which becomes the fourth of the new key; thus, in passing from the key of C to that of F, the flat B is introduced, and from the key of F to that of B the E is flattened, and so on. The modulation into the relative minor is generally effected by employing the sharp fifth, which becomes the seventh or leading note of the new key; thus in changing from C to A minor the G should be sharpened. As almost every piece ends on the key in which it begins, a second modulation becomes necessary; this is effected by flattening the fifth of the new key if the first modulation is into the dominant, and sharpening the fourth if in the subdominant. When a composer aims at a striking effect he may change from a given key to one quite unanalogous, from C to E for instance; but such transitions should be sparingly employed. Modulation is generally resorted to in compositions of some length, for the purpose of catching and pleasing the ear with a fresh succession of chords. In many short popular songs and hymn-tunes no modulation occurs.

MODULE, an architectural measure; the lower diameter of a column being divided into two parts, one is a module, and each module is divided into thirty minutes; thus neither is a determinate, but a proportionate measure. The term is also sometimes used with reference to the different sizes of medals.

MODULUS OF A MACHINE, a term sometimes used instead of *efficiency*, the ratio of the work usefully done by a machine to the work or energy given to it.

MODULUS OF ELASTICITY, a hypothetical quantity expressing the tensile stress required to make a straight bar of uniform section twice as long, or the crushing stress required to shorten it until it is of no length; on the supposition that this stress does not produce 'a permanent set,' or that the limits of elasticity are not exceeded during the lengthening or shortening. (See ELASTICITY.) When a bar is subjected to a small tensile stress, and then to an equal crushing stress, the amounts of lengthening and shortening are found to be equal. Hooke's law is true for small stresses; applied to this case it is, that the amounts of lengthening and shortening are proportional to the amounts of the stresses which produce them. The modulus of elasticity is merely a help to the memory; in employing it we assume

that the above laws are true for excessively great stresses. It is evident that if E is the modulus (expressed in pounds per square inch) of elasticity of any material, then a cylindric bar l feet long, of cross section a square inches, when fixed at one end, and pulled or pushed at the other with a distributed force of f lbs., will lengthen or shorten by the amount $\frac{fl}{Ea}$ feet.

MOEN, an island belonging to Denmark, separated from the south-east of Seeland by a sand-bank and narrow channel; greatest length, 18 miles; greatest breadth, 13 miles; area, including the small islands of Njord and Bogöe, 85 square miles. It belongs entirely to the cretaceous formation, and consists of masses of fine white chalk intermixed with flints. Its highest point above the sea is 460 feet, but the average does not exceed 150 feet. The soil is a marly loam of great fertility; and the high grounds, which are generally well-wooded, present a striking appearance when viewed from the sea. The largest town is Stege. Pop. (including Njord and Bogöe), 13,200.

MŒRIS (the modern *Birket-el-Kerûn*), a lake of Egypt. According to Herodotus, with whose account Diodorus and Mela agree, it was, in his time, 3600 stadia, or 450 miles, in circumference, and about 300 feet deep. He states it to have been entirely the product of human industry. Modern travellers describe it as at present about 30 or 40 miles long and 6 broad, and assert it to be a natural basin. The works, therefore, which Herodotus attributes to King Mœris must have been the canal now known as the Bahr Jusuf (Canal of Joseph), which connected the lake with the Nile, and the mounds, dams, and sluices which rendered it subservient to the purposes of irrigation. The fisheries of the lake were very productive. The revenue derived from them was, in the times of the Pharaohs, applied to the purchase of the queen's wardrobe and perfumes. Under the Persian rule they yielded, during the inundation season, when the canal fed the lake, a talent of silver (£150) to the royal treasury daily; but at other seasons only £60. In modern times the right of fishing has been farmed for £84.

MŒSIA, a country lying north of Thrace and Macedonia, and south of the Danube, corresponding to the modern Servia and Bulgaria. Its original inhabitants were, according to Strabo, a tribe of Thracians. In 227 B.C. a large body of Gaulish invaders entered Mœsia after the death of their leader Brennus, and settled there under the name of Scordisci. The Romans first invaded it in 75 B.C., penetrating as far as the Danube. It was not, however, until 29 B.C. that it was finally subjugated. The barbarians early conquered this region, and it remained in the hands of Slavonians and Bulgarians. See SERVIA and BULGARIA.

MŒSOGOTHS. See GOTHS and ULFILAS.

MOFFAT, a watering-place, Scotland, in the county of Dumfries, and about 20 miles N.N.E. of the town of that name, pleasantly situated in an amphitheatre of lofty hills in the valley of the Annan. The air is pure and bracing, showers are frequent, yet there is little mist or fog. The principal buildings are the Established, Free, United Presbyterian, and Episcopalian churches; several schools, the jail, the baths, with reading-rooms, hydropathic establishment, &c. Moffat Well, about 1½ mile distant, is reached by a pleasant road, which ascends slightly the whole way. The springs, which are saline sulphureous, are frequented by numerous visitors. Pop. 2161.

MOGADOR, or SUIRAH, a considerable town and the principal seaport of Morocco, about 110 miles west by south of the city of Morocco. It stands on a low sandy spot, which terminates towards the sea in rocks; during high-water springs the sea flows quite round the town, leaving an extensive swamp behind it. It is of an irregular form, encompassed by a wall, with flanking batteries at each angle, and a line of heavy guns on that portion of it which fronts the sea. The streets are straight, but narrow; buildings chiefly in the old Spanish style, of two and in some cases three stories, and mostly white-washed. The mosques are some of them splendid specimens of architecture. The streets are crowded with people—Jews, Moors, Ethiopians, &c.—and with camels, splendid Arab steeds, asses, mules, and oxen. The Jews, who amount to about 7000, reside in a quarter appropriated to themselves, and separated by a wall from that of the Moors, whose portion is called the citadel, where also the foreign merchants live. The whole of the laborious work in the town and port is performed by Jews; and the domestic servants are all Jews or Jewesses. The principal exports are wool, gum, wax, hides, skins, almonds, honey, ostrich feathers, and gold-dust; imports, iron, hardwares, and cotton goods. Pop. about 15,000.

MOGUL. See INDIA (HISTORY OF).

MOHÁCS, a town of Hungary, in the county of Baranya, on the Danube, 25 miles E.S.E. of Funfkirchen. It is the see of a bishop, whose palace is the most handsome edifice of the town; and has a Roman Catholic, a Greek Non-united, and a Protestant church, Franciscan monastery, post-office, county buildings, and gymnasium; and an active trade at its quay, on the Danube, where considerable quantities of wine, agricultural produce of all kinds, coal, wood, and other articles, are weekly loaded and despatched, chiefly to Vienna. The annual fairs, five in number, are much frequented; and at the principal one 20,000 head of fat cattle are often sold. The steamboats on the Danube have a station here. Two famous battles have been fought in the neighbourhood of Mohács—one in 1526, when Solyman, at the head of 200,000 Turks, defeated and slew Louis II., at the head of 30,000 Christians; and the other in 1680, when the Turks were defeated with the loss of 20,000 men. Pop. (1880), 12,385.

MOHAIR, the hair of a variety of the common goat which inhabits the mountains in the vicinity of Angora, in Asia Minor. It is soft and fine as silk, and of a silvery whiteness. The exportation of this article, unless in the shape of yarn, was formerly prohibited, but about the year 1820 this prohibition was removed, and the demand for Angora hand-spun yarn has almost ceased. England receives her chief supplies from the ports of Smyrna and Constantinople; and the principal seats of the spinning and manufacture are Bradford and Norwich. It is manufactured into camlets, plush, shawls, braidings and other trimmings for gentlemen's coats; and, in France, into a kind of lace, which has in a great measure superseded the more costly fabrics of Valenciennes and Chantilly. In 1882 goats' hair to the extent of 16,945,675 lbs., valued at £1,441,343, was imported into Britain.

MOHAMMED, MAHOMET, or more correctly MUHAMMAD (Arabic, The Praised, or, according to Deutsch and Sprenger, the predicted Messiah), the founder of Islamism, was the son of Abdallâh, a scion of the Hâshim family, and of Amina, of the Zuhra family, both of the influential tribe of the Koreish, but of a collateral branch only, and possessed of little wealth or power. The future prophet, whose original name was Halabi, was born either in 569, 570, or 571 A.D., in the holy city of Mecca. His father died shortly after his birth, leaving behind him the very slender property of five camels and a faithful female slave. According to tradition Mohammed, after the then prevailing custom of the Meccans, was handed

over to a Bedouin nurse named Halima, in order to be brought up in the salubrious air of the desert, and many are the stories told of these early years. Halima's flocks increased tenfold, her fields yielded grain in miraculous abundance, angels watched over the child, kept it free from all sin, instilled into it heavenly knowledge, and bestowed upon it the gift of prophecy. As the boy, however, suffered from fits, he was brought back to his mother at the end of two years. When six years old he lost his mother, and was adopted first by his grandfather, Abd-al-Mutallib, and at his death by an uncle, Abu Talib. This uncle, a merchant, destined Mohammed for the same employment, and was accompanied by him on a commercial journey to Syria. On this occasion he visited a Nestorian monastery, where he received impressions which perhaps contributed to give the tone to his subsequent character. He accompanied several of his relations in their forays and trading excursions. The Mohammedan writers are very prolix in their descriptions of the wonderful qualities of mind and body for which their prophet was eminent from his youth; he shared, however, the general ignorance of his countrymen. In his twenty-fifth year his uncle recommended him as agent to a rich widow, named Chadidja, and he acquitted himself so much to her satisfaction that she married him, and thus placed him in easy circumstances. She was fifteen years older than he, but he lived with her in happy and faithful wedlock, and till her death restrained the sensual appetites which he afterwards indulged. He seems to have had from his youth a propensity to religious contemplation, for he was every year accustomed, in the month Ramadhan, to retire to a cave in Mount Hara, near Mecca, and dwell there in solitude. At what time the idea of a new religion came into his mind, whence, in the midst of an idolatrous people, he derived the conviction of the unity of God, and to what degree he blended the ambition to assume the prophetic character with the struggle for personal aggrandizement, are questions to which only conjectural answers can be given. What part his epilepsy had in his visions we are equally unable to determine. That he was honest in his zeal to abolish idolatry and disseminate a purer doctrine, although he may have sought to obtain this object by deception, may be easily believed, if we remember the many examples of a similar inconsistency in other legislators and religious reformers.

Mohammed began his mission in the fortieth year of his age. He first converted his wife Chadidjah, to whom he communicated the particulars of an interview with the angel Gabriel, by whom he was declared an apostle of God. Through her instrumentality her uncle or cousin Waraka was gained, who is said to have been a Christian, and well acquainted with the Old and New Testaments. These were followed by Mohammed's servant Zeid, to whom he gave his freedom, and by his young nephew the fiery Ali. Of great importance was the accession of Abu Bekr, a man of estimable character, who stood in high respect, and persuaded ten of the most considerable citizens of Mecca to follow his example. They were all instructed by Mohammed in the doctrines of the *Islam*, as the new religion was styled, which were promulgated as the gradual revelations of the divine will, through the angel Gabriel, and were collected in the Koran. Three years passed in the quiet dissemination of his doctrines; in the fourth Mohammed invited the members of his tribe the Koreishites to an entertainment, openly announced to them his prophetic mission, and asked which of them would undertake the office of his vizier. All were silent, till the youthful Ali declared his readiness to do so, and at the same time his resolution to inflict vengeance on all who should dare to oppose his master. In vain did Abu Talib, the father of Ali, dissuade them from the undertaking. But although he remained himself unconverted, he did much to promote the new doctrines, by protecting Mohammed against his enemies, and affording him refuge in times of danger. On several occasions Mohammed was attacked by the adherents of idolatry with open force, and compelled to change his residence; but he often had the satisfaction of converting his bitterest enemies. In the tenth year of his prophetic office he suffered a severe loss in the death of Abu Talib and his faithful Chadidjah. Deprived of their assistance he was compelled to retire, for a time, to the city of Taïf. On the other hand, he was readily received by the pilgrims who visited the Kaaba, and gained numerous adherents among the families in the neighbourhood. At this time occurred Mohammed's famous nocturnal journey to heaven on the beast Al Borak, under Gabriel's guidance, respecting which the Koran contains some obscure intimations. In the twelfth year the Islam was also spread among the inhabitants of Medina (Yatreb), several of whom swore fidelity to the prophet, and proffered their assistance. Mohammed now adopted the resolution of encountering his enemies with force. Only the more exasperated at this they formed a conspiracy to murder him; warned of the imminent danger, he left Mecca, accompanied by Abu Bekr alone, and concealed himself in a cave not far distant. Here he spent three days undiscovered, after which he arrived safely at Medina, but not without danger (A.D. 622). This event, from which the Mohammedans commence their era, is known under the name of the Hejra, which signifies *flight*. In Medina Mohammed met with the most honourable reception; thither he was followed by many of his adherents. Mohammed now assumed the sacerdotal and regal dignity, married Ayesha, daughter of Abu Bekr, and as the number of the faithful continued to increase, declared his resolution to propagate his doctrines with the sword. The hopes of booty added new fervour to the religious zeal of his partisans. Their first great military exploit was the spoiling of a rich caravan, led by Abu Sofian, the chief of the Koreishites, with a strong guard. Mohammed surprised them, with an inferior force, in the valley of Bedr, and inflicted on them a total defeat. He took a rich booty and a number of prisoners. Other successful enterprises followed; but in the third year of the Hejra Abu Sofian, with 3000 soldiers, attacked Mohammed with 950, on Mount Ohod, not far from Medina. A desperate conflict ensued, in which Mohammed's followers were utterly beaten, and the wounded prophet hardly saved his life. This misfortune naturally shook the authority of him whose pretended mission from God should have secured him the victory. But by attributing the fault to the sins of his adherents, by promising the slain a paradise provided with all sensual enjoyments, and inculcating an unconditional predestination, he succeeded in restoring his tottering credit. In 627 Abu Sofian appeared before Medina with 10,000 men. Mohammed prudently limited himself to the defensive; but the enemy raising the siege, after twenty days, on account of internal discord, Mohammed, under the pretence of a divine command, led his party against the Jewish race of Koreidha, who had made common cause with the enemy. After twenty-five days the Jews were compelled to surrender their chief fortress to the will of the conqueror, who took the most bloody revenge, slaughtered between 600 and 700 men, and carried away the women and children into captivity. Some years afterwards he also took Khaibar, the principal seat of the Jewish power in Arabia, by which means he completed the subju-

[illegible] Abu Talib, [illegible] Mohammed [illegible] Abdallah [illegible] Amina [illegible] Abdallah

miracles, and always asserted that he was subject to the same failings, misfortunes, and afflictions as common humanity. Before the twelfth century it was hardly understood in the West that Mohammed was a man, and not a pretended deity; still earlier he was known as Maphomet, Baphomet, or Bafum, and believed to be a god to whom human sacrifices were offered up. Later it was customary for Christian writers to represent him as a vulgar designer, who by no means deceived himself about those revelations which he pretended to have received, but this opinion has now few representatives.

Mohammedanism, the name commonly given in Christian countries to the creed established by Mohammed, is not the designation used or recognized by his followers themselves. They call their creed *Islam* (entire submission to the decrees of God). We can give but a brief notice of the fundamental points of the faith, and the principal laws of the ritual and moral, the civil and criminal code. The dogmatical or theoretical part is called *Iman*, and embraces the following points:—1. Belief in God, who is without beginning or end, the sole Creator and Lord of the universe, having absolute power, knowledge, glory, and perfection. 2. Belief in his angels, who are impeccable beings, created of light, the four chief of whom are the Holy Spirit, or angel of revelations, Gabriel; the special protector of the Jews, Michael; the angel of death, Azrael or Raphael; and Israfil or Uriel, the angel who sounds the last trumpet at the resurrection. 3. Belief in Jinn (genii), who are created of smokeless fire, and are subject to death. These Jinn are of two kinds, good and evil, the chief of the latter being Iblis (Despair), once called Azazil, who, refusing to worship Adam, was rejected by God. The Jinn, too, have different names and offices—Peri (Fairies), Div (Giants), Takrins (Fates), Efrits, Ghouls, &c. 4. Belief in the Holy Scriptures, which are his uncreated word revealed to the prophets. Of these there now exist, but in a greatly corrupted form, the Pentateuch, the Psalms, and the Gospels; and in an uncorrupted and incorruptible state the Koran, which abrogates and surpasses all preceding revelations. Besides these an apocryphal Gospel, attributed to St. Barnabas, and the writings of Daniel, together with those of certain other prophets, are held in some esteem, but not considered canonical books. 5. Belief in God's prophets and apostles, the most distinguished of whom are Adam, Noah, Abraham, Moses, Jesus, and Mohammed. Jesus is more excellent than any who preceded him, was born of a virgin, is a spirit proceeding from God, but not partaking of his essence, and is not to be worshipped as the son of God. Mohammed is the greatest of them all, the last of the prophets and the most excellent of the creatures of God. 6. Belief in a general resurrection and final judgment, and in future rewards and punishments, chiefly of a physical nature. The dead are examined after death by Monkar and Nekir, two officers of the other world, who question the corpse as to his belief in God, and who, according to the answer, torment or speak kindly to him. The souls of prophets enter immediately into paradise; those of martyrs partake, in the shape of green birds, of the delights of the abodes of bliss; those of common believers either stay near the grave, reside with Adam in the lowest heaven, remain on the well of Zem-Zem, or rest in the form of white birds under the throne of God. The souls of unbelievers dwell in a certain well in the province of Hadramaut, or, after being offered to and rejected by heaven and earth, are subjected to cruel torture until the day of resurrection. Mohammed seems to have held that both soul and body will be raised, but wide diversity of opinions prevail among the theologians on this point. The time of the resurrection is a mystery, which Gabriel would not reveal even to Mohammed. It will be announced by three blasts—that of consternation; that of examination, which shall annihilate all beings and things, except paradise and hell, with their inhabitants; and after a lapse of forty years, that of resurrection, when all men will have their souls breathed into their restored bodies, and will rest in their tombs until final judgment is pronounced. At the day of judgment, jinn, men, and animals rise from their graves, and sentence being pronounced, the blessed will enter paradise while the damned pass into hell. Both, however, have to cross the bridge Al Sirat, which stretches above the gulf of hell, and is finer than a hair, and sharper than a sword. The righteous easily pass over the bridge; but the wicked tumble headlong into hell. Hell is divided into seven stages or stories, respectively allotted to Mohammedans, Jews, Christians, Sabæans, Magians, idolaters, and, lowest of all, to the hypocrites. All Moslems and those who believed in the unity of God will be eventually released, but others will suffer eternally. The blessed will be met at one of the eight gates of paradise by beautiful youths and angels, and according to their degrees of righteousness will be their degrees of bliss. It is not, however, a person's good works which gain him admittance, but God's mercy alone. The poor will enter 500 years before the rich. The enjoyments will consist of feasting in delicious variety, eating from golden dishes, drinking copiously of wine, which, however, will not inebriate; the meanest of the faithful will have costly and brilliant garments, have 80,000 servants, besides seventy-two houris, the black-eyed girls of paradise, who will always remain in the bloom and vigour of youth. They may also have their former wives if they wish them. Their tents will be adorned with the finest jewels. Music of the most entrancing kind will be provided by the angel Israfil and the houris; harmonious sounds will everywhere arise from the clanging of the bells suspended from the trees, whose fruits are pearls and emeralds. Those deserving a higher degree of recompense will be rewarded by the sight of God's face night and day. A separate paradise is reserved for women, but the nature of their enjoyment is not known. The 7th and last article of the Moslem's creed is the belief of God's predestination of all events both good and evil.

The practical part of religion (Din) inculcates the following duties, of which the first four are the most important: 1. Prayer, including preparatory purifications. The ablution which is more especially preparatory to prayer, consists in washing the hands, mouth, nostrils, face, arms as high as the elbow (the right first), each three times; and then the upper part of the head, the beard, ears, neck, and feet, each once. The purification extends not only to the believer himself, but also to the ground or carpet on which he kneels, which must be made as clean as possible. Prayers must be offered up five times in the course of twenty-four hours. The first time of prayer commences at the Subh or daybreak; the second at the Duhr, or about noon; the third at the Asr or afternoon; the fourth at the Maghrib, or about sunset; and the fifth at or after the Eshé or nightfall. The commencement of each of these periods is announced by a chant (*Adan*), sung by a crier (*Mueddin*) from the mad'neh or minarets of each mosque. On each of these occasions the Moslem has to offer up certain prayers held to be ordained by God, and others ordained by his prophet; each kind consisting of two, three, or four rek'ahs, that is, the repetition of a set form of words, chiefly from the Koran, and ejaculations of 'God is most great!' &c., accompanied by par-

ticular positions of the body, part of the words being repeated standing, part sitting, and part in other postures; an inclination of the head and body, followed by two prostrations, distinguishing each rek'ah. It is also necessary that the face of the worshipper be turned towards the kebla, that is, in the direction of Mecca. These prayers may in some cases be abridged or even omitted. Other prayers must be performed on special occasions: the congregational prayers on Friday, the Mohammedan sabbath, with additional prayers and exhortations by the Imám (priest); on the two grand annual festivals; on the nights of the Ramadhan or month of fasting, during eclipses, for rain, before a battle, on a pilgrimage, at funerals, &c. The Moslems have no clergy in our sense of the word, the civil and religious law being bound up in one. Second in importance to prayer stands the duty of giving alms, which must be performed at least once a year, the alms given being cattle, corn, fruits, saleable wares or money. Next comes the duty of fasting. The Moslem must abstain from eating and drinking, and from every indulgence of the senses, every day during the month of Ramadhan, from the first appearance of daybreak until sunset, unless physically incapacitated. As Ramadhan often falls in mid-summer, abstinence from drinking in particular must often be very trying. On the first day of the following month a festival called the Minor festival is observed with public prayer and general rejoicing, which lasts three days. The fourth paramount religious duty of the Moslem is the performance at least once in his life, if possible, of the pilgrimage (el-Hadj) to Mecca and Mount Arafat. The Kaaba must be encompassed seven times, the black stone being kissed at each round, and Mount Arafat must be visited. On the following day (the 10th of the month Zu-l-Hejjeh) those pilgrims who are able to do so offer up the sacrifice El Fidah (the ransom, in memory of Ishmael's sacrifice); part of the victim he should eat, and the rest he should give to the poor. This festival, which is otherwise observed like the minor one above mentioned, lasts three or four days. We can do little else than mention the less important ritual and moral laws. Circumcision is general, but is not absolutely obligatory. The distinctions of clean and unclean meats are nearly the same as in the Mosaic code; camel's flesh is, however, permitted to the Mohammedan. Blood and swine's flesh are specially condemned. A particular mode of slaughtering animals for food is enjoined, accompanied by the repetition of the name of God. Wine and all intoxicating liquors are strictly forbidden. Music is also condemned, but most Moslems take great delight in hearing it. Games of chance, such as dice, cards, are prohibited, but chess and other games of skill are allowed. Usury is strictly forbidden. Images and pictures of living creatures are contrary to law. Charity, probity in all transactions, veracity (except in a few cases), and modesty, are indispensable virtues. Cleanliness in person and decency of attire are particularly required. Silk clothes and ornaments of gold and silver are forbidden to men, but allowed to women; but this precept is not strictly regarded. Utensils of the precious metals are also condemned, but are, however, frequently used. The manners of Moslems in society are subject to particular laws or rules with respect to salutations.

Upon the following principal points of civil and criminal law all Moslems are agreed. A man may have four wives at the same time, and as many concubine slaves as he pleases. He must not marry his mother, daughter, sister, half-sister, aunt, niece, foster-mother, the daughter or the mother of his wife, his father's or son's wife, two sisters at the same time, nor women who stand related to each other, as aunt and niece. A man may, through excessive love, or after having failed in obtaining a woman of his own faith, marry a Jewess or a Christian; but a woman is permitted on no account to marry out of her faith. A declaration of their intention to marry each other by a man and woman at the age of puberty before two witnesses, and the payment of part of the dowry, constitutes a legal marriage. A man may divorce his wife on the slightest pretext, mere dislike forming a sufficient reason. He has to give back part of her dowry, however. He may divorce her twice, and take her back without any ceremony; but if he divorces her three times, or by the triple sentence, he cannot make her his wife again unless by her own consent and by a new contract, and after another man has consummated a marriage with her and divorced her. Unless a wife can prove gross ill treatment on the part of her husband, she cannot obtain release from him, and she has to forfeit part of her dowry notwithstanding. She is also obliged, like a widow, to wait for a certain period before marrying again. The children of a wife and those of a concubine slave, if acknowledged by the father, inherit equally. Sons inherit equally; so also do daughters, but a daughter's share is half of that of a son. One-eighth is the share of the wife or wives of the deceased if he has left issue, and one-fourth if he has left no issue. A husband inherits one-fourth of the wife's property if she has left issue, and one-half if she has left no issue. The debts and legacies of the deceased must be paid first. A man may leave one-third of his property in any way he pleases. Where there is no legal heir the property falls to the crown. When a concubine slave has borne a child to her master she becomes free on his death. Creditors are recommended by the Koran to remit debts due to them by poor debtors; and when a debtor is insolvent, and unable to work so as to discharge the debt by his personal labour, there is no further claim against him. Monopoly in trade is condemned. Murder is punishable by death, or by a fine paid to the family of the deceased if they prefer it. In cases of intentional wounds a certain proportionate fine must be paid by the offender to the injured party; the payment for a nose or member of the body which is not found twice is the full price of blood, the same as homicide; for a hand or foot it is half as much; for a finger or toe a tenth; and so on. Theft, if the property stolen is above half a crown in value, is punishable, according to the injunctions of the Koran, by loss of the right hand, except in certain cases; but nowadays the ordinary punishments of imprisonment, hard labour, and the bastinado have been substituted. Adultery, if attested by four eye-witnesses, is punished in the case of a married woman by death (stoning); fornication in either sex by 100 stripes and one year's banishment. Drunkenness is punished with eighty stripes. Apostasy, if persevered in, and blasphemy, are punished by death.

Almost immediately after the death of Mohammed a dispute arose among his followers as to his successor. A strong party were in favour of Ali, the husband of the prophet's daughter Fatima, but he was not chosen until a lapse of twenty-three years, during which time the throne had been occupied by Abu Bekr, Omar, and Othman. Yet a tradition that the first three caliphs were usurpers has prevailed to the present day among a large number of Moslems, and hence the first ground of dissension between the Sunnites and the Shiites, the latter being the followers of Ali, while the former accept the legitimacy of the first three caliphs. Other points of difference soon cropped up. The Shiites place Ali at least on a level with Mohammed; the Sunnites place a wide interval between the Prophet and every other mortal. It is a mistake to suppose that the Shiites reject the

Sunna (oral traditions) entirely; they refuse to accept such parts as come from Abu Bekr, Omar, and Othman, but they accept the rest, together with other traditions not recognized by the Sunnites. The strength of the Shiites lies in Persia, of the Sunnites in Turkey and its dependencies. In times of religious apathy the two parties have been known for a brief season to dwell together, but generally they detest and anathematize each other as worse than Jews and Christians. The Sunnites are subdivided into four sects—Hanefites, Malekites, Shafeites, and Hanbalites, so called after their respective founders. These, however, all recognize each other as orthodox on fundamental points. The remaining sects (to which we can do no more than allude) have arisen chiefly out of controversies on the divine attributes, on predestination and free-will, on future rewards and punishments; on the Mahadi or Medhi, the twelfth Imám, looked for by the Persians as about to return as the destroyer of Degial or Antichrist in the latter days; and on mysticism. One of the most energetic of the recent Mohammedan sects is that of the Wahabees, founded towards the close of the seventeenth century by Abdul Wahab, who sought to bring back Islamism to its pristine condition under Mohammed. They protested against the growing practice of venerating the prophet and other saints as intercessors, and endeavoured to restore the rules of the Koran in many of the details of life. They increased so much in power that they obtained possession of Mecca and Medina. As a political power they were ultimately suppressed in the beginning of the present century by the Pasha of Egypt, but their principles are not yet extinct. For further information on the sects refer to ISHMAELITES, KARMATHIANS, KORAN, SUNNITES, WAHABEES, &c.; and for details on the life and religion of Mohammed consult the biographies of Sprenger, Muir, Washington Irving, Weil, Nöldeke, &c.; Ockley's History of the Saracens, Burckhardt's Notes on the Bedouins and Wahabees, Palgrave's Journey through Central and Eastern Arabia, R. Bosworth Smith's Mohammed and Mohammedanism, &c.

MOHAMMED II., Turkish Sultan, surnamed *the Great* and *the Victorious*, born at Adrianople in 1430, succeeded his father, Amurath II., in 1451. After securing himself on the throne by the murder of his two brothers and the suppression of an insurrection in Karaman he resolved to complete the conquest of the enfeebled Greek Empire by the capture of Constantinople. The Christian powers in Europe remained quiet spectators. April 6, 1453, Mohammed appeared before Constantinople, to which he laid siege by land with an army of 300,000 soldiers and by water with 300 galleys and 200 small vessels. The besieged had drawn strong iron chains before the harbour, and made a brave resistance, though they had but about 10,000 men to oppose so great a force. But Mohammed, having contrived to get a part of his fleet over land into the harbour, and caused a bridge of boats to be constructed and occupied with cannon, the Greeks were overcome, after a defence of fifty-three days, and the empire came to its end. The city was taken by storm on the 29th May, and abandoned to pillage. The Emperor Constantine Palæologus fell, at the commencement of the assault, sword in hand. In a few hours the conquest of the city was completed. The conquerors gave themselves up to all kinds of cruelty and excess. When he entered the city he found it desolate; but as he designed it for the principal seat of his empire he strove to attract new inhabitants by promising the Greeks full religious liberty and permitting them to choose a new patriarch, whose dignity he himself increased. Constantinople under him soon became again flourishing. He restored the fortifications, and for greater security caused forts to be erected at the mouth of the Hellespont. Mohammed pursued his conquests, which were checked for a time by Scanderbeg, prince of Albania, who was favoured by the mountainous character of the country. The sultan finally concluded peace with him, but after Scanderbeg's death, in 1466, soon subjugated all Albania. His further advances into Hungary were prevented by the celebrated John Huniades, who obliged him in 1456 to raise the siege of Belgrade, in which he had lost 25,000 men, and had been himself severely wounded. The son of Huniades, King Matthias Corvinus, also kept the Turks from Hungary, and even took from them Bosnia. On the other hand Mohammed conquered in a short time Servia and all the Peloponnesus, most of the islands of the Archipelago, and the Greek Empire of the Comneni, established in the beginning of the thirteenth century at Trebizond, on the coast of Asia Minor. The Christian powers began to be apprehensive of the progress of his arms, and at the instigation of Pope Pius II. in 1459 a crusade against the Turks was resolved upon at Mantua, which was never, however, executed, on account of the bad constitution of most of the European states. From the Republic of Venice Mohammed tore Negropont in 1470. He also stripped them of other possessions, and took Caffa from the Genoese in 1474. Frequent wars with the Persians prevented the further prosecution of his enterprises against the Christian powers. In 1480 he attacked the Island of Rhodes, but was repulsed by the knights of St. John with great loss. He now turned his arms against Italy, took Otranto, and would probably have pursued his conquests in this country but for his death in 1481 on an expedition against Persia. During his reign of thirty years he had conquered twelve kingdoms and upwards of 200 cities. His character was distinguished by talents, ambition, and courage, and disgraced by cruelty, perfidiousness, sensuality, and contempt of all laws. He spoke Greek, Arabic, and Persian; understood Latin: drew and painted; had a knowledge of geography and mathematics and of the history of the great men of antiquity. In short, he would have been a hero had not his cruelties blackened his reputation. His memory is revered by the Turks, as being the founder of their empire in Europe.

MOHAMMED IV., born in 1642, was raised to the throne while a boy of seven years, his father, Ibrahim, having been murdered in an insurrection of the janizaries. His mother, an ambitious woman, managed the government, but perished in a revolution of the seraglio. The celebrated grand-vizier, Mohammed Kuperli (or Kuprili), was now placed at the head of the government. To this great minister, and to his equally great son and successor, Achmet, the Turkish Empire was indebted for the consequence which it maintained till the end of the seventeenth century. Mohammed was himself an insignificant personage, whose principal passion was the chase. Kuperli turned his chief attention to the restoration of the internal tranquillity of the empire, to which he sacrificed a great number of persons. The war begun in 1645 against the Venetians mainly respecting the Island of Candia was but weakly prosecuted. But in 1667 Achmet Kuperli undertook the famous siege of this island (see CANDIA), which lasted two years and four months. The capitulation was signed September 5, 1669, at the same time with the terms of peace between Venice and the Turks. A war had already broken out (1660) with the Emperor Leopold on account of Transylvania. The Turks had made considerable progress in Hungary when they were totally defeated August 3, 1664, by

Montecuculi at St. Gothard. Nevertheless, to the astonishment of all, the emperor accepted the disadvantageous truce of Temeswar of twenty days proffered by the Turks. Never had the Turks approached so near the boundaries of Germany as now. The anarchy which prevailed in Poland under King Michael and the disturbances of the Cossacks gave occasion in 1672 to a war of the Turks against Poland, which had to purchase peace on ignominious conditions. But the great Polish general, John Sobieski, revenged the ignominy of his nation by a decisive victory at Choczim in 1673, and in 1676 obtained from the Turks an honourable peace. Sobieski also contributed most essentially to the relief of Vienna, which was besieged for more than six weeks by the grand-vizier, Kara Mustapha, with 200,000 men, in the war caused in 1683 by the malcontents in Hungary. The Turks were attacked in their camp September 2, by the allied Christian army, and defeated with extraordinary loss. The grand-vizier atoned for his ill success with his life. The emperor, Poland, Russia, and Venice now concluded an alliance against the Turks, who suffered losses in every quarter—for example, they were utterly defeated at Mohacs by Charles, duke of Lorraine. As all these misfortunes were attributed to the effeminacy and inactivity of the sultan, Mohammed IV., he was deposed in 1687, and died in prison in 1691.

MOHAMMED ALI. See MEHEMET ALI.

MOHAMMEDAN ERA. See EPOCH.

MOHAWK, a large branch of the Hudson or North River of New York, which rises in the north-east part of Oneida County, about 20 miles north of Rome, to which place it runs nearly south, and then turns eastward towards the Hudson, which it enters by several mouths between Troy and Waterford after a course of about 135 miles. With the aid of canals, many of which it feeds, the Mohawk is navigable from Schenectady to Rome. It is remarkably well adapted for supplying water-power for all manufacturing purposes. The chief towns on its banks are Rome, Utica, Little Falls, and Schenectady.

MOHAWKS, a tribe of North American Indians, belonging to the confederacy of the Five (afterwards Six) Nations. (See IROQUOIS.) With the rest of the confederacy they adhered to the British interest during the war of the revolution, and left the country on its termination for Canada, where lands were assigned them on the Grand River.

MOHICANS, or MOHEGANS, a tribe of Indians formerly occupying the country now forming the south-western parts of New England and that portion of New York east of the Hudson.

MOHILEV, a town in Russia, capital of a government of the same name, on both banks of the Dnieper, 212 miles W.S.W. of Moscow. It consists of the town proper, surrounded by a rampart, a citadel on a commanding height, and a suburb. The town, partly of stone and partly of wood, is tolerably well built, and has spacious streets and a large octagonal square occupied by the principal buildings, among others the palace of the Greek archbishop and the bazaar. The staple manufacture is tobacco; and the trade with Riga, Memel, Dantzig, and Odessa, chiefly in leather, wax, honey, potash, oil, and grain, is very extensive. Pop. 40,536, many of whom are Jews.—The government, bounded north by Vitebsk, east by Smolensk, south-east by Orel, south by Czernigov, and west by Minsk, is about 210 miles long from north to south by 112 miles broad, and has an area of about 18,545 square miles. The surface, though in the line of watershed which divides Europe into two great basins, is generally flat, and sends its waters chiefly to the South Dwina, but partly also to the Dnieper. The soil is fertile, though very imperfectly cultivated, and the forests, chiefly of oak and fir, cover extensive tracts. The principal mineral is bog iron ore. Both trade and manufactures are limited. Pop. 947,625. There is another Mohilev in the government of Podolsk, on the left bank of the Dniester, 60 miles E.S.E. of Kamenetz, with a pop. of 18,129.

MÖHLER, JOHANN ADAM, a Roman Catholic theologian, born at Igersheim, 6th May, 1796, took priest's orders in 1819, and in 1820 became repetent, and in 1822 private teacher of theology in the University of Tübingen. After making a tour of the principal Catholic and Protestant universities of Germany—as Göttingen, Berlin, Prague, Vienna, and Landshut—he turned his attention to church law, and undertook a regular course of lectures on church history and the fathers. He was appointed ordinary professor of theology in 1828, in which year he was also admitted to the degree of Doctor of Divinity. His work, The Unity of the Church, or the Principle of Catholicism (Tübingen, 1825), attracted great attention, established his reputation, and procured for him an invitation to Freiburg. He did not accept it, nor another to Breslau, but after publishing his Athanasius the Great, and the Church of his Time, in conflict with Arianism (Mayence, 1827), he became professor of theology in the University of Tübingen. But the work which attracted most notice, and drew forth many answers from Protestant writers, especially from Dr. F. C. Baur (1833), was his Symbolik, of which a sixth edition was published at Mayence in 1844. The violent controversies occasioned by his works having offended the Würtemberg government rendered his situation at Tübingen unpleasant, and after Prussia had offered him the choice of a chair either at Bonn, Breslau, or Münster, he in the beginning of 1835 accepted one at Munich. Here he wrote little, and occupied himself chiefly with the duties of his chair. A short time before his death, in 1838, he had been appointed dean of the cathedral of Würzburg. His smaller miscellaneous writings (Gesammelte Schriften und Aufsätze, two vols. Ratisbon, 1839) were collected and published by the now famous Dr. Döllinger; and his Patrologie, or Christian Literature (one vol. Ratisbon, 1839) was edited and published by Professor Reithmayr of Munich. Möhler is at once the most acute and the most philosophical of the modern controversialists of his church, and even the highest Protestant opinion classes him among the greatest theologians of the century.

MOHS, FREDERICK, the founder of the natural method in mineralogy, was born January 29, 1773, at Gernrode, in Anhalt. After the early death of his father, who was a merchant, he was obliged to continue the business, but a decided inclination for science, and more especially for mathematics, made him resolve to adopt a different career. He accordingly studied at Halle, attended the mining academy of Freiberg, and soon obtained an appointment in Anhalt-Bernburg. This he soon resigned in order to take part in the establishment of a scientific institution in Dublin. Not succeeding here he returned to Freiberg, and proceeded in 1802 to Vienna, when he undertook to describe the mineral collection of the banker Van der Null. In the description which he published (Vienna, 1804) he first laid the grounds of the classification which he afterwards more fully developed. He shortly after made a geognostic and mineral survey of a great part of the Austrian dominions. In 1811 he became professor of mineralogy in the Johanneum at Gratz, and in 1817 made a tour in Great Britain. While in Edinburgh he received and accepted an invitation to succeed Werner in the chair of mineralogy at Freiberg. In 1826 he went in

the same capacity to Vienna. He died at Agordo, near Belluno, in 1839. His principal works are Die Charaktere der Klassen, Ordnungen, Geschlechter und Arten oder Charakteristik des naturhistorischen Mineralsystems (Dresden, 1820), and Grundriss der Mineralogie. The latter work was translated into English by his pupil Haidinger, with numerous additions, and published at Edinburgh in 1825 (3 vols.)

MOIDORE (from the Portuguese, *moeda d'ouro*, literally, coin of gold), a gold coin formerly used in Portugal (from 1690–1722), of the value of 4800 reis, or about £1, 7*s.* sterling.

MOIR, DAVID MACBETH, better known by his pseudonym of *Delta*, was born in Musselburgh on 5th January, 1798, and educated for the medical profession, as a practitioner of which in his native town the whole of his life was spent. He early showed a turn for literary composition, both in prose and verse, and became a frequent contributor, first to Constable's and afterwards to Blackwood's Magazine, where his more serious effusions were subscribed by a Δ. Among the comic articles contributed by him were The Eve of St. Jerry, and the Auncient Waggonere, and what may also come under the same category, the Autobiography of Mansie Wauch, certainly one of the most mirth-moving productions ever written. Having made the friendship of the celebrated novelist Galt he was intrusted by him, on the latter departing for America, with the task of finishing his tale the Last of the Lairds. In 1824 he published the Legend of Genevieve, with other Tales and Poems, and in 1829 he married. In 1831 appeared his Outlines of the Ancient History of Medicine, and the following year two able pamphlets on Malignant Cholera. A volume entitled Domestic Verses, containing among others his touching poem of Casa Wappy, on the death of an infant son, was published in 1843. In 1846 he was lamed for life by being thrown from a carriage, and in 1851 he made his last public appearance in the delivery of a series of lectures on the Poetical Literature of the Past Century at the Philosophical Institution, Edinburgh. In June of the last-mentioned year he sustained a severe wrench in dismounting from his horse, and from that moment sank rapidly in strength. He set out on an excursion to Dumfries in hopes of re-establishing his health, but in vain, as he expired there on 6th July. His remains were honoured by a public funeral, and interred in the churchyard of Inveresk, Musselburgh. An obelisk has been erected to his memory in his native town. In 1852 his friend Thomas Aird edited a selection from his poems, and furnished a memoir of the poet.

MOIRE, the French name given to the best watered silks. The silks for this purpose, though made in the same way as ordinary silks, are of double width, and must be of a stout substantial make. In fact they often weigh for equal surface several times heavier than the best ordinary fabrics. Thin and narrow silks will not do. It is indispensable, to obtain the bold waterings, that they should be both wide and of good quality. Care must also be taken that they should be folded so that every thread may be perfectly parallel, and that they should not ride one across the other, but lie all in the same direction in the usual way of the web and the warp. They should also be folded in such a way that the air contained between the folds should not be able to escape easily. They are then subjected to an enormous pressure, of from 60 to 100 tons, generally in a hydraulic machine, and the air in trying to escape drives before it the small quantity of moisture that is used, and hence is effected the permanent marking called watering, which is for the most part in curious waved lines. The finest kinds of watered silks are known as *moires antiques*. Woollen fabrics to which the same process has been applied are called *moreen*. *Moire*, *moreen*, and *mohair* are apparently connected etymologically.

MOIRÉE MÉTALLIQUE, a French term for what in this country is called crystallized tin-plate. It presents a variegated flowered appearance, resembling the figuring produced on windows by frost. The process consists in the application of some dilute nitro-muriatic acid for a few seconds to the surface of the tin-plate when in a heated state. It is then washed with water, dried, and varnished or coated with lacquer. The figures are more or less beautiful and diversified according to the degree of heat and relative dilution of the acid. The ease and cheapness of the process made it at one time very common for inferior articles in tin, but it is much less in vogue now than it was some years ago. A modified kind of moirée métallique is produced by the action of heat without acids; and if the heating of the plate can be so managed as to be unequal at different parts there results a variation in the moirée, to which it is sometimes attempted to give a regular pattern.

MOISSAC, a town of France, Tarn-et-Garonne, on the right bank of the Tarn, here navigable and crossed by a handsome bridge, 15 miles W.N.W. from Montauban. It is surrounded by a shady boulevard occupying the site of the ancient ramparts; is well built; has the fine old church of St. Pierre, dating from the year 1100, entered by a remarkable portal, on which numerous fantastic sculptures are engraved; a court of first resort and commerce; a communal college, and a considerable trade by the Tarn, particularly in fine flour, exported to the Levant and the colonies, oil, saffron, wine, and wool. Pop. 9202.

MOKANNA, AL, or BORKAI (*Hakem Ibn Hashem*), styled the *Veiled Prophet*, a Mohammedan impostor of the eighth century. Being blind of one eye he used to hide his face under a gilded mask, which his followers ascribed to the splendour of his countenance. He attributed to himself divine powers, and is said, by means of his chemical and other knowledge, to have performed many apparent wonders. He gained many followers, so that at last the caliph was compelled to send an armed force against him. He retired to a fortress in Transoxiana, where he first poisoned and then burned his family, and then burned himself. His followers continued to pay him divine honours after his death. He is the hero of Moore's Veiled Prophet of Khorassan.

MOLA-DI-BARI, a town in the Kingdom of Italy, in the province and 12 miles E.S.E. from Bari, on the Adriatic, delightfully situated among gardens and olive groves. It consists of an old and a new town, the former surrounded by a wall and ditch, and defended by a castle, but the houses are poor and in bad condition; the streets narrow, irregular, and dark. The latter, lying along the sea-side, is much better built. The harbour is insecure, and the roadstead, though it has depth of water for the largest vessels, is quite open. Pop. (1881), 12,274.

MOLAR TEETH. See TEETH.

MOLASSES, or MELASSES, the latter form more accordant with etymology (Latin, *mellaceus*, honey-sweet), the liquid or uncrystallizable part of the juice of the sugar-cane, which separates from the granulated part or sugar. (See SUGAR.) The name is also applied to the similar portion of any other vegetable juice from which sugar is obtained. Molasses differs from treacle, which drains from sugar in the process of refining, not of manufacture.

MOLD, a parliamentary borough and market town of North Wales, in Flintshire, pleasantly situated on a hill in the centre of a beautiful plain, 6 miles south of Flint, and 12 west of Chester. It has a station on the Chester and Denbigh Railway, a branch of the London and North-Western Railway. The town con-

sists of several good streets, which are tolerably wide, clean, and well lighted with gas. The principal buildings are the parish church, an ancient edifice in the Gothic style; several dissenting places of worship; national, denominational, and private schools; county-hall, containing the court-rooms; the town-hall, containing the market and a concert-room; militia barracks, rifle volunteer depot, police station, &c. There are several large collieries, lead-mines, mineral-oil works, limestone quarries, and potteries in the neighbourhood. There is a good trade in farm produce, and also in the minerals of the district. Mold unites with Flint, &c., in sending a member to Parliament. Pop. of urban sanitary district in 1881, 4320.

MOLDAU, a river of Bohemia, which rises in the Schwarzberg, on the frontiers of Bavaria, flows first south-east to Rosenburg, where it suddenly turns almost due north, and continuing to follow that direction, though in a somewhat circuitous course, passes Budweis, and after receiving several tributaries, and having now become a noble river, it traverses the town of Prague, and ultimately, after changing its direction and turning due east, joins the Elbe on the left, 17 miles north of Prague. It greatly facilitates the navigation of that river by the body of water which it contributes. Its whole course is about 230 miles. It begins to be navigable at Rosenburg, where its north course commences, but at first only for shallow barges. Below Prague it floats vessels of 60 tons. It is well supplied with fish.

MOLDAVIA. See ROUMANIA.

MOLE, the type of the family Talpidæ, which is included in the order Insectivora of the class Mammalia. The Common Mole (*Talpa Europæa*) is a sufficiently familiar member of this family, which possesses representatives in Africa and North America also. The body in the moles is covered with a thick glossy hair of furry consistence. The toes, five in number to each foot, are furnished with strong claws of a curved shape, and which are admirably adapted for the fossorial or burrowing operations of these forms. The fore-feet are sharp-edged on their inner aspects, the palms being turned backwards and outwards—a structure well adapted for scooping out the earth from the burrow; whilst the hinder limbs are used to throw the material behind the animal as it burrows forward. The eyes of the adult mole are rudimentary and are functionally useless, but are still represented in a structural sense; whilst external ears are wholly wanting. The internal ears, however, are very perfectly developed, as also is the olfactory sense. The tail is short and abortive, or may be absent altogether in some genera. Strong clavicles or collar-bones are developed, and these bones, together with the short arm, combine to render the fore limbs efficient organs in the burrowing habits of these animals. The carpal or wrist bones present a peculiarity in structure in that one of these bones bears a curved process, which gives to the hand a greater amount of support, and materially increases its power in digging. The breast-bone, like that of the bat or bird, bears a strong median crest or keel for the attachment of the great pectoral or breast-muscles, which in greater part move the fore limbs. The skull is of elongated shape, the muzzle being pointed and supported by a special bony process; whilst the muscles of the head and neck are largely developed. All the kinds of teeth are represented, the molars being furnished with cusps or sharp prominences for crushing the insect prey upon which these animals subsist. In length the common mole measures on an average about 4 inches. Common in England and Scotland, the mole is said to be comparatively rare in Ireland. This species is the only British representative of the family. The females bring forth four or five young about the month of April, and these are lodged in a special nest carefully prepared by the parent animals. The nest is generally formed at the intersection of several passages, and is lined by young grass and soft roots. A hillock generally, though not always, marks the site of the nest. The galleries of moles exhibit great ingenuity and skill in their excavation; the habitation, formed under a hillock, consisting of an upper and lower gallery. These galleries communicate by five passages, the principal chamber being contained within the lower and larger gallery. From this central point the mole excavates a series of tunnels, leading to the foraging or hunting grounds of the animal; these roads being so arranged as to afford easy and instant access from any point to the central galleries or place of habitation. Moles live in pairs, and appear rarely to invade the territories of neighbouring families. The food consists of worms, insects, and larvæ; and they are said to skin the worms before devouring them. In habits these animals are exceedingly voracious. Hunger soon kills them, and that they are of a pugnacious disposition has been clearly ascertained; the weaker forms being inevitably slain when an encounter takes place, as occasionally happens in the roads and tunnels of the habitations. The moles appear to require a large supply of water; and miniature wells are sunk in various situations, when they are situated at a far distance from a brook or ditch. The question of their hybernating habits in winter is not definitely settled. It is certain, however, that during the colder season they display much less activity than in spring and summer. The *Talpa cæca* of Southern Europe is entirely destitute of eyes. The African Golden Mole (*Chrysochloris aureus*) is so named from the iridescent hues which the hairs of the fur are capable of producing, a beautiful display of metallic colours being thus seen on the fur of these animals. The 'Star-nosed Moles' of North America (*Condylura macrura*) are so named from the star or fringe like arrangement of the nasal cartilages. These structures probably subserve the sense of touch. These latter forms possess a long tail, narrow at the base, but large in the middle, and again tapering at the tip. The Shrew Moles (*Scalops*) of North America are more properly included among the Shrews (which see). The Japan Mole (*Talpa wogura*) of Siebold is but little known. It differs materially in its dentition from its more familiar neighbours. (See Pl. XXXVIII.-XXXIX. figs. 17, 18, and 23.)

MOLE, in engineering, a mound or massive work formed of large stones laid in the sea, extended either in a right line or an arch of a circle before a port, which it serves to defend from the violent impulse of the waves, thus protecting ships in a harbour. The word is sometimes used for the harbour itself.

MOLÉ, MATTHIEU, president of the parliament of Paris and an eminent statesman, was born at Paris in 1584. His father, also president of parliament, had distinguished himself by his prudence and courage in that station during the troubles of the league, and the son gained not less honour during the disturbances of the Fronde. His integrity and fearlessness often resisted the arbitrary measures of the despotic Richelieu; and under the no less ambitious, but less vigorous Mazarin, he acquired the esteem of all parties. In 1610 the king named him president of one of the chambers of inquests, and in 1614 *procureur général*. In 1641 he was appointed first president of the parliament through the influence of Richelieu, whom he had opposed in the process against the Marshal de Marillac. The disturbances of the Fronde soon after commenced. In this contest of factions Molé defended with equal prudence and

sagacity the interests of justice and freedom, as well as those of the court; and when Paris became the theatre of tumults, conducted himself with so much firmness and dignity that his bitterest enemies could not withhold from him their approbation; and even Condé and Cardinal De Retz were forced to esteem him, although his unshaken rectitude and devotion to the welfare of the nation and the safety of the throne frequently frustrated their designs. At one time, indeed, wearied with the intrigues of the interested and ambitious, and unprotected by the feeble and wavering court, he voluntarily resigned the seals, and rejected the offer of a cardinal's hat for himself, and of the place of secretary of state for his son, by which Anne of Austria wished to indemnify him for the loss of his office. But he was soon obliged to resume the difficult station, and was more than once threatened with personal violence by the furious partisans of the Fronde, whom he overawed by his inflexible dignity. These unhappy disputes between the parliament, the court, and the leaders of the Fronde, did not cease until after Louis XIV. had assumed the reigns of government. Under his brilliant and artful despotism the freedom of the parliament and of the nation perished together. Molé died at Paris in 1656. In the Memoirs of De Retz and the other records of the time of the regency of Anne of Austria and Mazarin, Molé's influence in the troubled state is everywhere perceptible, and all voices agree that a better man could not have been at the head of affairs in that stormy period. He himself left some 'Memoirs' bearing on the stirring events in which he acted so great a part, which were published at Paris, 1855 (four vols. 8vo).

MOLE CRICKET (*Gryllotalpa vulgaris*). This genus of insects is classified in the Orthoptera, and is included in the tribe Gryllina of that order. These insects occur in Britain and France, where they are known under the name of *Courtilières;* but they are local, and limited to certain districts in their distribution. In length the mole-cricket averages about 2 inches. It is of a reddish-brown colour, the middle part of the body inclining towards a grayish hue. The anterior pair of limbs are converted into powerful burrowing organs, being flattened, expanded at the foot portions, and turned outwards in the same manner as the hands of the mole, to which animal, in the general conformation of its body, this cricket bears a marked resemblance. These insects burrow in the ground, and construct their nests in the form of subterranean galleries, in the central portion of which the habitation or dwelling cavity is excavated. In this cavity the eggs, about 200 or more in number, are deposited in the spring. The eggs average each the size of a grain of rice, and the nest is carefully watched and protected from the raids of other insects. The burrowing operations of the mole-crickets are exceedingly destructive to the roots of plants, and in this way they become an annoyance to the gardener. Their food appears to consist chiefly of other insects, larvæ, and worms. The male chirps like other crickets; but his sound is of a more feeble description than that of the common species of cricket. In winter these forms appear to burrow to a greater depth than in summer, and they have thus been found at a depth of 18 inches from the surface. A species of mole-cricket has been described as occurring in the West Indies, where it is exceedingly destructive to the sugar-canes. (Pl. LXV.–LXVI. fig. 13.)

MOLECULE, in physics, that small portion of a substance which cannot be divided physically, but which is divisible chemically into its atomic constituents. A molecule may be defined as a small mass of matter the parts of which do not part company during the excursions which the molecule makes when the body to which it belongs is hot. This latter definition is that of Professor Clerk Maxwell, whose molecular theory is sketched in the article GAS.

MOLECULES, the name given in biological and physiological science to the minute ultimate particles found in organic bodies and in organic fluids, and which are conceived by the *molecular theory of organization* to constitute the primary constituents of all the tissues and fluids of living organisms. These molecules—seen in chyle, for example—vary in size from a degree of inconceivable minuteness to a size of about the $\frac{1}{10000}$ part of an inch. In certain cells, or in fluids, they are seen to exhibit definite movements—the so-called *molecular movements*—and possessing in this way a spontaneous, inherent, or independent power of motion, they are regarded by some physiologists as being in themselves of essentially vital nature. Thus these molecules are regarded as constituting the essential part of the fluids in which they occur. By their aggregation they form cells, and these cells aggregate to form tissues. In this way the whole living organism may be viewed as arising from a molecular origin. The name of Bennett of Edinburgh is associated with this molecular theory of organization, this physiologist having been the originator and expounder of the theory; which, however, seems inadequate wholly to explain vital formation in all its aspects. Molecules constitute probably only one of the many primary forms or structures in which vitality resides.

MOLESWORTH, SIR WILLIAM, born on the 23d of May, 1810, became, at the age of thirteen, by the death of his father, eighth Baronet of Pencarron, in Cornwall. Having been rusticated when a student at Cambridge for challenging his tutor, he studied at Edinburgh and in Germany. On his return to England in 1831 he was elected as a reformer for the eastern division of Cornwall, and kept his seat, notwithstanding a dissolution of Parliament, till 1837, when, despairing of a third re-election, he became a successful candidate for Leeds. From 1841 to 1845 he was without a seat, but in the latter year, on a vacancy in Southwark by the death of one of the members, he was returned by a large majority. In Parliament his speeches, though not distinguished by fluency or oratorical talent, were so solid as to command the attention of the house and the country; and his views with regard to colonial government, after long opposition, came so much into favour that he was appointed principal colonial secretary in 1855. He had been employed in the public service before, having in January, 1853, accepted the office of first commissioner of public works in the administration of the Earl of Aberdeen. He had held the office of colonial secretary only for eight months, when he died on the 22d of October of the same year at the comparatively early age of forty-five. His parliamentary duties did not absorb his whole attention. At one time he was both proprietor and editor of the Westminster Review. He also edited a reprint of the works of Thomas Hobbes in sixteen vols. 8vo. He accumulated materials for a life of Hobbes, which he did not live to complete.

MOLFETTA, a town and seaport of Southern Italy in the province of Bari, and 15 miles W.N.W. of the city of Bari, on the Adriatic. It has a striking appearance when approached from the sea, and a number of good houses, some of them built of a white stone resembling marble; but the streets are narrow, and by no means clean. It has a magnificent cathedral and several other churches and a college; manufactures of linen and saltpetre; a harbour, well sheltered except on the north, and provided with a

building-dock; and a considerable trade in corn, oil, and fruit. From the numerous vases, urns, and other antique remains found in its vicinity, it is surmised that it occupies the site of some earlier but forgotten town. Pop. in 1881, 29,697.

MOLIÈRE, the assumed name of JEAN BAPTISTE POCQUELIN, the celebrated French comic writer, was born at Paris, January 15, 1622. His father was *valet de chambre* and upholsterer to the king. In his fourteenth year he enjoyed the instructions of the Jesuits, and made great progress. Gassendi, Chapelle, Bernier, were his teachers. When his father had become debilitated he had to discharge his office about the person of Louis XIII. In 1641 he accompanied the king to Narbonne. The French theatre had at that time begun to flourish through the talents of the great Corneille; and the young Pocquelin, who had imbibed a strong passion for the stage, now formed a company of young persons of similar tastes, exchanged his family name for that of *Molière*, and resigned the office of his father. His company soon became distinguished. During the troubles of the Fronde he is lost to our view, but after the restoration of order we find him at the head of a strolling troop, which acted L'Étourdi at Lyons in 1653. This is the first comedy written in verse by Molière. The truth of the dialogue, the inexhaustible skill of a valet who is continually employed in rectifying the blunders of his master, the interest of the situations arising therefrom, have kept this piece on the stage notwithstanding the want of connection between the parts, the stiffness of the personages, and the incorrectness of the style. Molière gained equal applause as a poet and an actor, and drew all the spectators from another company at Lyons. Till that time all the French pieces had been full of improbable intrigues. The art of representing character and manners on the comic stage was reserved for Molière. This art, the germ of which is seen in L'Étourdi, united with variety of incident, kept the attention of the spectators awake and concealed the faults of the piece. L'Étourdi was acted with equal applause in Béziers. Here the Prince of Conti, who had known Molière at school, had just assembled the estates of Languedoc. He received the poet as a friend, and intrusted him with the charge of amusing the town and the assembly. Le Dépit Amoureux and Les Précieuses Ridicules were brought forward in the theatre of Béziers, and were admired. In Le Dépit Amoureux the incidents are better arranged than in L'Étourdi. In the actions of the personages a genuine comic vein is exhibited, and their language displays much spirit and humour; but the plot is too complicated, and the *dénouement* not sufficiently probable. The plot in the Précieuses Ridicules is more simple. A delicate satire on the prevailing affectation of the character of *bel esprit* and of a romantic style, on the pedantry of learned females, and affectation in language, thoughts, and dress, is the object of this comedy. It produced a general reform when it was brought forward in Paris. The spectators laughed, recognized themselves, and applauded. Louis XIV. was so well pleased with the performances of Molière's company that he made it his own company, and gave its director a pension of 1000 livres. Sganarelle, ou le Cocu Imaginaire appeared in 1660. This piece also contains a fund of sportive humour, and keeps the spectators continually amused. Censure was not silent on its appearance, but was not listened to. Don Garcie de Navarre, in imitation of the Spanish, was criticized with more justice. It is a cold attempt at a more elevated style. L'École des Maris, the idea of which is drawn from the Adelphi of Terence, contains a simple and entertaining plot and a natural *dénouement*. The theatre still resounded with the applause with which this piece was received, when Les Fâcheux, projected, executed, and committed to memory, by the actors within a fortnight, was performed at Vaux at the residence of Fouquet, intendant of finances, in the presence of the king and court. This comedy is almost destitute of plot, but the intention was to interest the spectators by the multiplicity of characters, the truth of the portraits, and by the elegance of the language. It is said that the king, on going away from the first performance, happening to see the Count Soyecourt, a tiresome narrator of his exploits in the chase, said to Molière, 'There is an original that you have not copied.' In twenty-four hours the scene of the hunter was inserted; and as Molière was not acquainted with the terms of the chase, he requested Soyecourt himself to explain them to him. L'École des Femmes (1662) met with critics, who, overlooking the art which prevails in the management of the inferior personages, and in the natural and quick transition from one surprise to another, animadverted upon some negligences of style. Molière answered them by his spirited Critique de l'École des Femmes. The Impromptu de Versailles was a reprisal occasioned by an attack of Boursault, who had written a piece against him, entitled Le Portrait du Peintre. The court was very much pleased in 1664 with La Princesse d'Élide, a comic ballet, prepared for an entertainment given by the king. Another ballet, Le Mariage forcé, is drawn from Rabelais. Don Juan, ou le Festin de Pierre, excited much reprehension by the impiety of some of the expressions placed in the mouth of the profligate hero. Molière retrenched the objectionable parts in the second representation. L'Amour Médecin is one of the over-hasty works which are not to be strictly criticized. It was written, studied, and represented within five days. In this piece Molière for the first time attacks the physicians, which, it is said, he was induced to do by the fact that an ignorant and avaricious practitioner cheated him by overcharges. His great piece Le Misanthrope was but moderately well received at first, but in the sequel was justly considered as one of the finest productions of modern comedy. It must nevertheless be allowed that it has been more admired in the closet than it has pleased on the stage—the reason Voltaire believes to be because the plot is delicate and ingenious rather than lively and interesting; because the dialogue, with all its beauty, does not always seem necessary, and therefore retards the action; and because the *dénouement*, though skilfully introduced, leaves the spectator unexcited. He adds that the Misanthrope is a more delicate and a finer satire than those of Horace and Boileau, and at least equally well written, but that there are more interesting comedies, and that Le Tartufe, for example, unites the same beauties of style with a much more lively interest. In 1665 appeared Le Médecin malgré lui, a farce full of humour. Le Sicilien, ou l'Amour Peintre, is a short piece which pleases by its grace and gallantry. But his reputation was carried to its highest summit when Le Tartufe appeared. Weak minds and pretended saints cried out against the author, but the piece was played and applauded after it had been kept back for years by the clamour. In this hypocrisy is fully unveiled, the characters are equally various and true, the dialogue is elegant and natural, the *dénouement* alone is unsatisfactory. An impious and obscene farce, entitled Scaramouche, having been represented at court, the king said to the great Condé, as he was leaving the theatre in his company, 'I should like to know why the people, who are so much scandalized at Molière, say nothing about Scaramouche.' 'The reason is,' replied the prince, 'that Scaramouche

ridicules only God and religion, about which these people care nothing, while Molière's piece ridicules themselves.' In 1668 Molière published his Amphitryon, a free imitation of Plautus. With the exception of a tedious scene between Jupiter and Alcmena, nothing can be more humorous. L'Avare (the Miser), an imitation of the Euclio of Plautus, is, in the leading character, a little overdone; but the multitude is only to be struck by strong traits. George Dandin, ou le Mari confondu; Monsieur de Pourceaugnac; Les Fourberies de Scapin, are rather amusing than instructive. Le Bourgeois Gentilhomme, though mixed with some buffooneries, is highly comic and full of power. Molière bestowed more care on his Femmes Savantes, a witty satire on affected taste and pedantic learning, which at that time prevailed in the Hôtel de Rambouillet. The incidents are not all well connected; but the subject, dry as it may be in itself, is exhibited in a truly comic form. The development is admirable, and has been a hundred times imitated. The same is true of the Malade imaginaire, in which the quackery and pedantry of the physicians of the times are fully delineated. With this piece the author concluded his career. He was indisposed when it was performed. His wife and Baron urged him not to play. 'What,' he replied, 'will all the poor players do? I could not forgive myself for neglecting a single day to give them bread.' The exertion with which he played produced convulsions, which were followed by a hemorrhage. He died after the lapse of a few hours, February 17, 1673. The Academy did honour to itself and Molière in 1778 by erecting a bust of him, with the verse of Saurin:

'Rien ne manque à sa gloire; il manquait à la nôtre.'

The Archbishop of Paris at first refused him burial; but the king himself insisted on it, and he was interred in the cemetery behind the chapel of St. Joseph, Rue Montmartre. In 1792 his remains were transferred to the Museum of French Monuments, whence in 1817 they were removed to Père Lachaise.

Molière is the true father of French comedy. His works may be considered as a history of the manners, fashions, and tastes of his times, and as the most faithful pictures of human life. Born with an observing mind, skilful in catching the outward marks of the passions and emotions, he took men as they were, and, with singular felicity, exhibited the most secret recesses of their hearts, and the tone, the action, and the language of their various feelings. 'His comedies,' says Laharpe, 'properly read, may supply experience, because he has depicted not mere passing follies, but human nature, which does not change. Of all who have ever written, Molière is the one who has best observed men without seeming to do so. His knowledge of human character seems to have come by intuition. His pieces are as pleasing when read as when performed. Molière is a writer for those of ripened age and the gray-haired. Their experience corresponds to his observations, and their memory to his genius.' Among the many eminent critics who have eulogized the works and genius of Molière may be mentioned Henri Martin, Nisard, Hipp. Lucas, Goethe, and Sainte-Beuve. In his domestic relations Molière was not fully happy; he who made merry on the stage with the weaknesses of other men could not guard against his own weakness. A violent passion induced him to marry the daughter of the actress Béjart, and he thereby incurred the ridicule which he had so often cast on husbands of a disproportioned age. He was more happy in the intercourse of his friends; and the Marshal Vivonne, the great Condé, and even Louis XIV., admitted him to a footing of intimacy. As an actor Molière was not to be surpassed in high comic parts, such as Arnolphe, Orgon, Harpagon, &c. In 1773 Bret published an edition of his works at Paris (in six vols.), with interesting commentaries. An edition published at Paris in 1838 gave the actors' names after the *dramatis personæ*, from which we learn that Molière always played the principal comic parts himself. A more complete edition, containing some recently discovered pieces, is that by M. Aimé-Martin. Among the last and best editions are that of Lemerre and that in Messrs. Hachette's Collection des Grands Écrivains.

MOLINA, Luis, a Jesuit and professor of theology at the Portuguese university of Evora, was born at Cuenca, in New Castile, in 1535, and has become known by his theory of grace. In order to reconcile man's free-will with the Augustinian doctrine of grace he published a work with the title Liberi arbitrii cum gratiæ donis, divina præscientia, providentia, prædestinatione et reprobatione concordia (Lisbon 1588). In this work he undertook to reconcile the free-will of man with the foreknowledge of God and predestination. Predestination, he asserts, is consequent on God's foreknowledge of the free determination of man's will, and does not, therefore, in any way affect the freedom of the particular actions, as a requital of which man is predestined to punishment or reward. God never fails to grant sufficient grace in order to do good and merit happiness, to those who ask it with fervour. This exposition was assailed as a revival of the Pelagian controversy, and as setting aside the special election of the predestined by making each individual, in the exercise of his free-will, become the arbiter of his future destiny. His views were violently opposed by the Dominicans, but were adopted by the Jesuits, who were hence called Molinists. The dispute between them and the Thomists was referred to Pope Clement VIII., and after his death to Paul V., whose decree of 1607, while permitting both parties to promulgate their own opinions, prohibited them from accusing each other of heresy. Molina died at Madrid 12th Oct. 1601. See Jansenius and Grace.

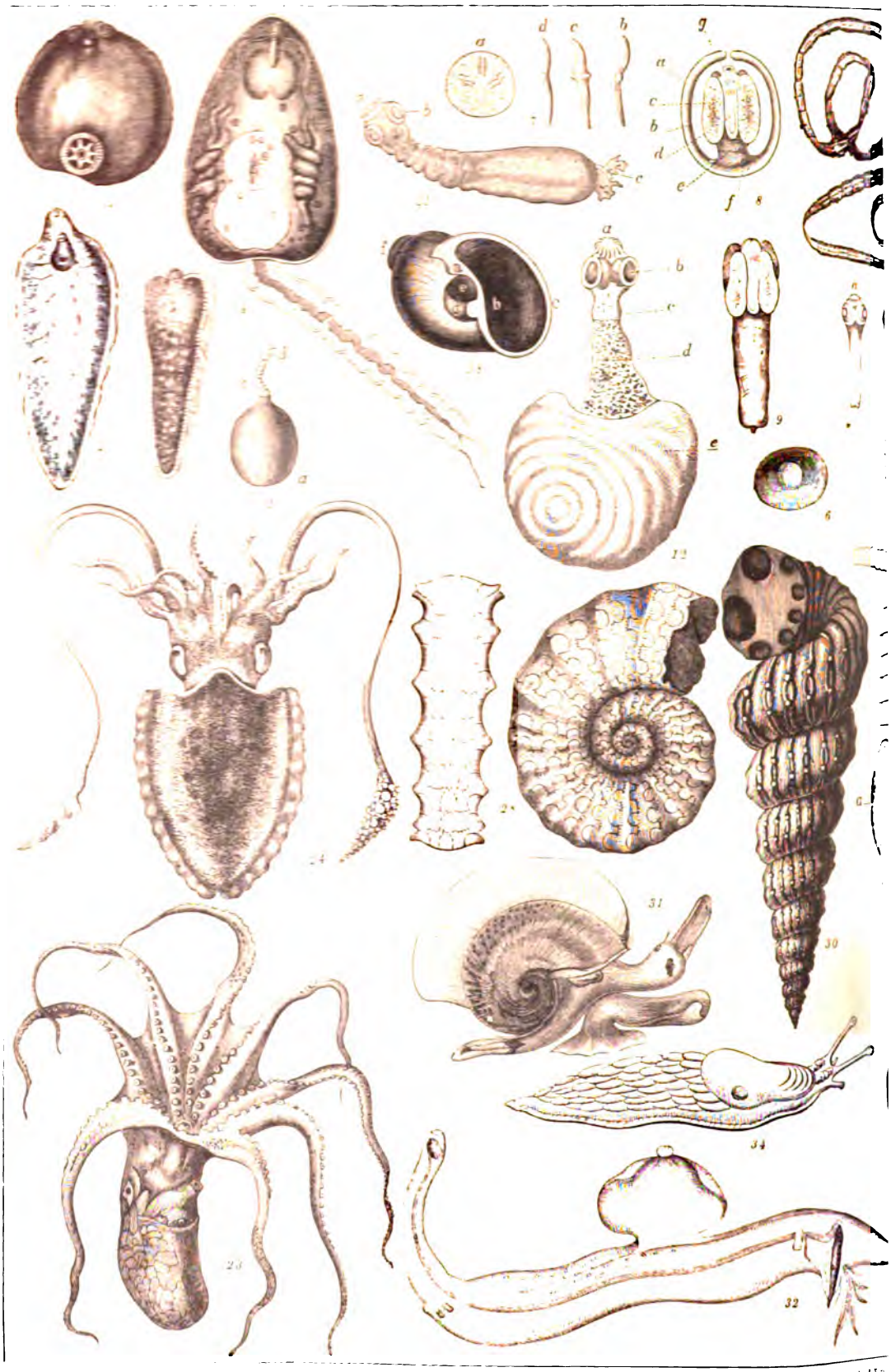
MOLINOS, Miguel, a celebrated Spanish mystic and theologian, was born at Saragossa, 21st Dec. 1627, and died in prison, 29th Dec. 1696, in his seventieth year. He was educated at Pampeluna, where he took holy orders, and he obtained his theological degree at Coimbra, whither he had proceeded for the furthur prosecution of his studies. Though gradually rising to distinction in his own country he repaired to Rome, where his reputation as a director of conscience and a guide in the spiritual life soon became very high. In 1675 he published the Spiritual Guide, an ascetical treatise, which propagated mysticism throughout the whole of Italy. In this treatise Molinos promulgated a new religious doctrine, which came to be known as *Quietism*. (See Quietism.) He had now acquired such prestige that persons of all countries, belonging to the highest ranks of society, addressed themselves to him for enlightenment and guidance in cases of conscience. The famous preacher F. Segneri publicly called in question the principles of the treatise, as containing the seeds of a dangerous and seductive error; for by annihilating the will it annihilated at the same time the action of religion and the intervention of the priest. But his strictures were ascribed to jealousy of the personal influence acquired in the religious world by Molinos, who enjoyed besides a great reputation for sanctity. For this reason, and because Pope Innocent XI., as yet only Cardinal Odescalchi, was his professed admirer, it was necessary to proceed against him with caution, a task which the Jesuits undertook. In 1685 he was cited before the

Holy Office, and imprisoned. In 1687 the Inquisition condemned sixty-eight propositions, which it asserted were to be drawn from his books, a Treatise of the Daily Communion having been published by Molinos in addition to The Spiritual Guide. A great mass of papers and letters, numbering it is said 20,000, had been seized in his house, and were produced against him. The very dangerous error attributed to Quietism of making internal perfection compatible with the worst external excesses, if substantiated, fully justified the Inquisition in its procedure. The error, if not expressly formulated in The Spiritual Guide, follows almost necessarily from some of its maxims, and seems to have been admitted by Molinos himself. It is asserted also that his own conduct was not free from suspicion. His sentence bore that he should publicly abjure his doctrines, and be subjected to close imprisonment. He spent the rest of his days as a prisoner in a convent of the Dominicans.

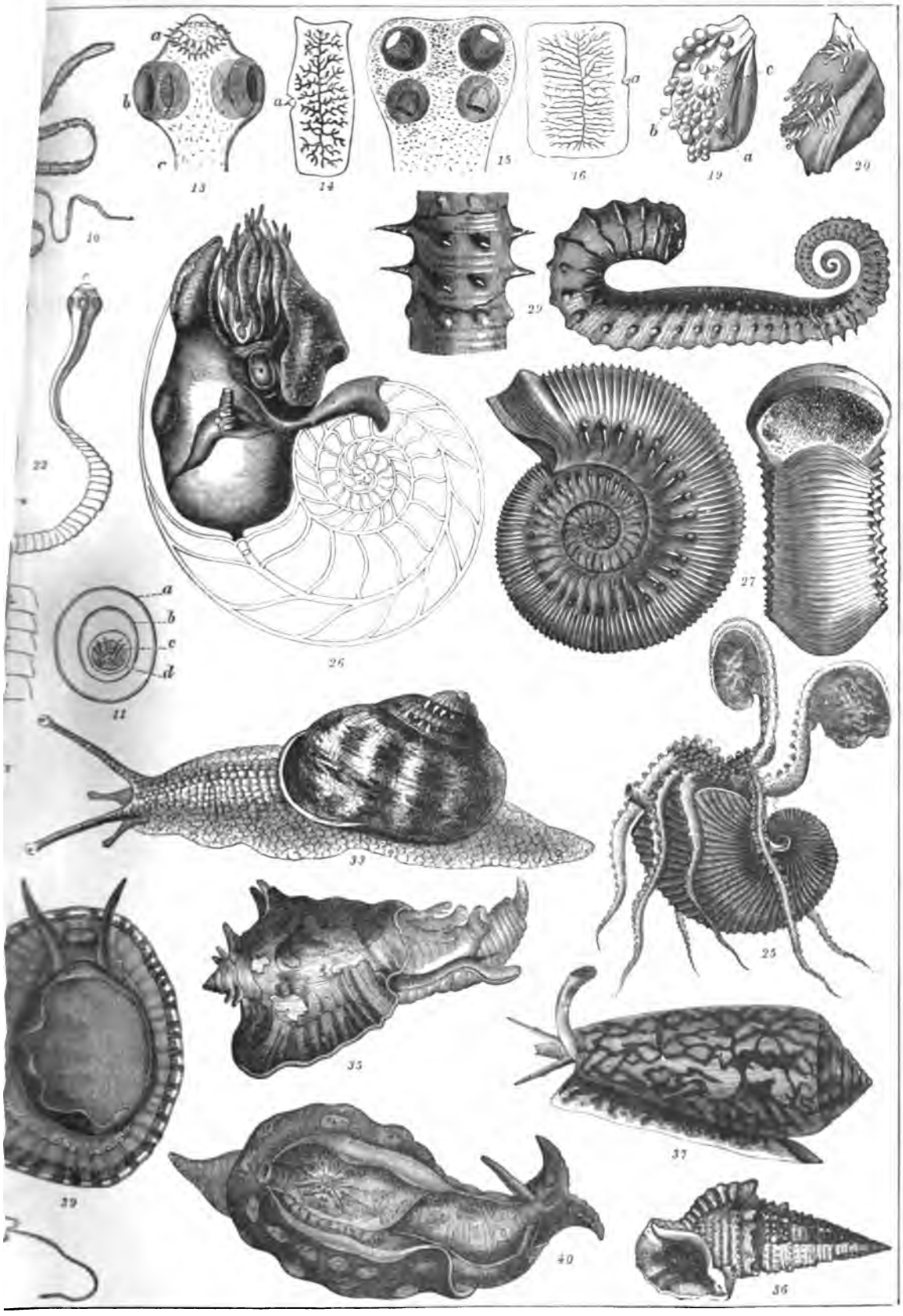
MOLLAH, a spiritual and judicial officer among the Turks, who has civil and criminal jurisdiction over towns or whole districts, and is therefore a superior judge, under whom are the *cadis*, or inferior judges. Over the *mollahs* are the *cadileskers*, or supreme judges of the empire, who sit in the divan. The Turkish mollah must not be confounded with the Tartar mulla.

MOLLUSCA. The term Mollusca, derived from the Latin *mollis*, soft, was applied by Cuvier to denote one of the great primary sections into which the animal kingdom, in his system of classification was divided. Cuvier's name was given to the group from the generally *soft* nature of the bodies of the animals included within its limits. But so far as the mere softness of their bodies is concerned, it cannot be maintained that Molluscs possess any special peculiarity in this respect; and when we consider that in the majority of instances the Mollusca possess a hard exoskeleton or *shell*, the term 'soft-bodied' is seen to be somewhat of a misnomer, and to be inapplicable in a certain sense to the group. Still, apart from its derivation, the term Mollusca serves as well as any other name to indicate this large sub-kingdom of the animal world. Owen's name of *Heterogangliata* has been frequently employed to designate the Mollusca; but the latter term has, for obvious reasons, and for its simplicity and priority of application, been that by which the group is best known. The distinctive characters of the Mollusca as a sub-kingdom are found, firstly, in the general, though by no means universal presence of an exoskeleton, popularly known as the 'shell.' Molluscous animals—of which cockles, whelks, snails, cuttle-fishes, sea-mats, lamp-shells, and sea-squirts may be cited as familiar examples—are generally denominated in popular parlance as 'shell-fish,' and to the general nature and mode of formation of the shell a few sentences may appropriately be devoted in the first instance. Those Molluscs in which the shell is wanting, or in which it is of a rudimentary nature, or concealed by the integuments, are said to be *naked*, in contradistinction to the *testaceous* Molluscs, or those which possess well-developed shells. Wherever a shell is present it bears a general relation to the respiratory or breathing-organs, and is usually devoted to the protection and inclosure of these structures. In its simplest form, as seen in slugs (*Limacæ*), or as in the Heteropoda (*Carinaria*), the shell exists as a mere covering to the breathing-organs; and in its more complicated types the shell may still be observed to possess intimate relations to the respiratory surfaces. Shells, such as those of the whelk, limpet, or snail, which consist of a single piece, are termed *univalve* shells. Those which are composed of two halves or *valves*, such as the shells of cockles, oysters, mussels, &c., are known as *bivalve* shells; whilst in one family of Gasteropodous Molluscs—the *Chitonidæ* or Coats—the shell, which consists of more than two pieces, is termed *multivalve*. The *testaceous* Molluscs envelope a rudimentary shell whilst the animal is still within the egg, and this embryonic shell forms the nucleus of that structure in the adult. In the naked Molluscs, a rudimentary embryonic shell is also generally found, but this does not undergo further development, and is thrown aside as maturity is attained. Shells are secreted by the soft integument or skin of Mollusca, to which the name of the *mantle* or *pallium* (Pl. CXXX.–CXXXI. fig. 22, *c*) is given (See MANTLE.) The chief mass of the shell is composed of carbonate of lime, combined with a small proportion of animal matter. Externally, and especially in the shells of fresh-water Molluscs, the shells are covered by a thick layer of horny matter, known as the *epidermis* or *periostracum*. The shells themselves are entirely non-vascular, that is, are not permeated by any prolongations of the mantle or circulatory system, and they thus possess no independent vitality, but are dependent entirely upon the vascular mantle for their due formation, growth, and repair. The outward extension or enlargement in length and breadth of the shell is effected by the circumference or margin of the mantle-lobes, which at this part exhibit a thickened structure. The new calcareous matter which is destined to extend the border of the shell is secreted by the glands of the mantle-edge; and layer after layer may in this way be added to the circumference of the shell by the closely-applied edges of the mantle-lobes. Lines of growth, corresponding to the successive layers of material thus added to the shell, may be traced in many shells. Ridges and projections in the shell are formed by the more active deposition of calcareous matter by certain circumscribed portions of the mantle-edge, as compared with the work of secretion by other portions. The pallial glands which thus secrete calcareous matter, also include colour or pigment glands among their number, and the secretion of colour goes on simultaneously with that of the limy material. The increase in *thickness* of the shell is accomplished by the outer surface of the mantle generally, or by that surface which immediately lines the valves of the shell. The matter thus secreted and added to the thickness of the shell, is different in texture and character from that added to the circumference, and which provides for its outward growth. These inner layers form the *nacreous* or *mother-of-pearl* (see MOTHER-OF-PEARL) structure so familiar to all, seen in the interior of shells—this matter being colourless, but possessing the property of giving off iridescent hues. It is this latter material which in certain Molluscs, and when deposited through injury or irritation in sufficient abundance, constitutes the valued pearls. (See SHELL.)

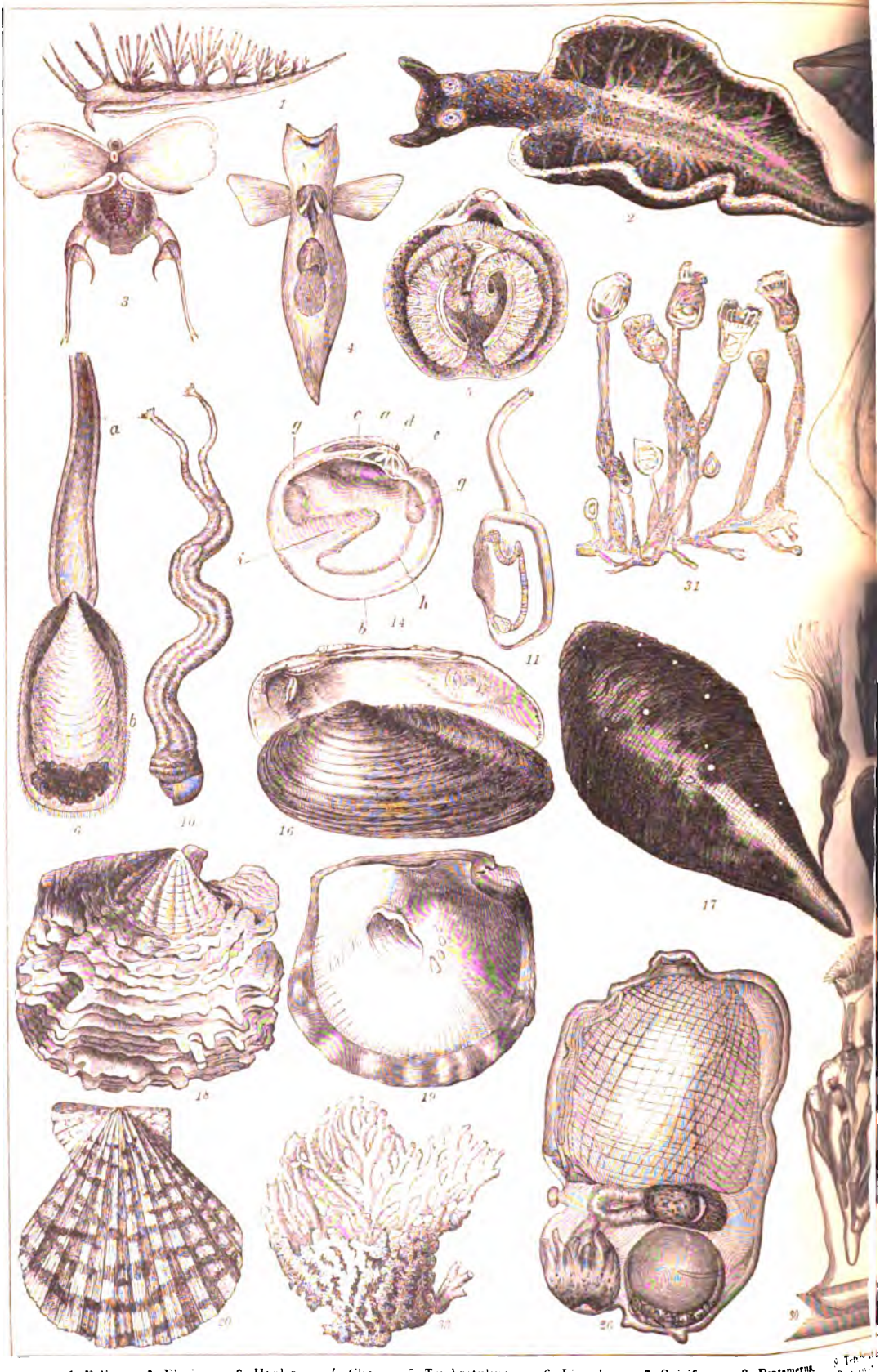
A second character of very great importance in the distinction of the Molluscan type of structure is found in the character and disposition of the nervous system. Typically, the nervous centres of Mollusca are disposed to form three great nerve masses or ganglia, connected by commissures or nervous cords. Of these centres one is situated in the head region, above the gullet, and is hence known as the *cephalic*, *supra-æsophageal*, or from its analogy to a brain, as the *cerebral* ganglion. The second, situated in the neighbourhood of the foot or organ of motion, is known as the *pedal* or *infra-æsophageal* ganglion. And the third, found in the neighbourhood of the heart and gills, is known as the *branchial* ganglion; or as the *pariéto-splanchnic* ganglion, from the fact of its supplying the walls (*pariétes*) of the body, and the viscera (*splanchna*) generally with nerves. Of the three ganglia, the



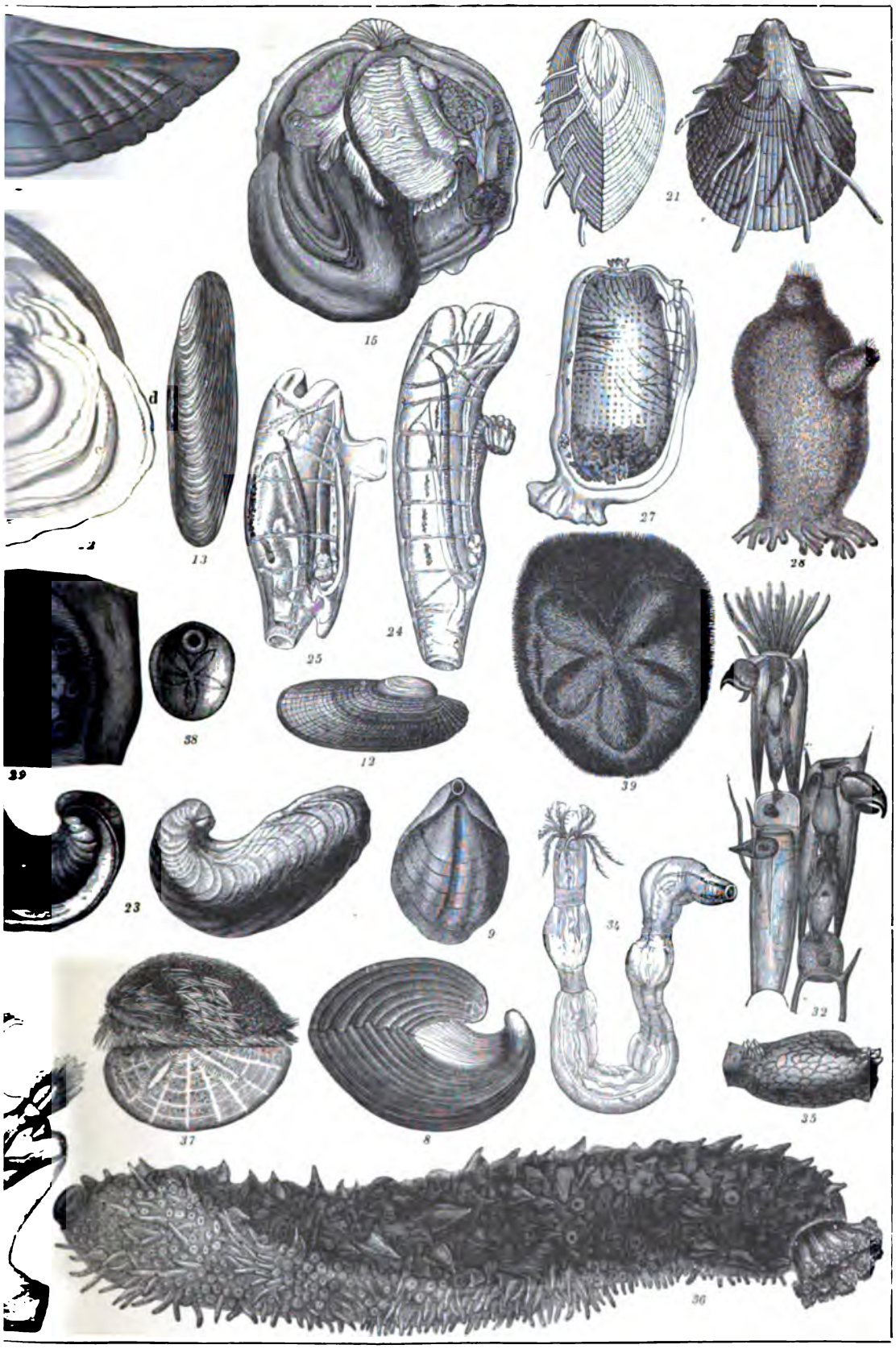
1. [illegible] 2. Lower Valve of Do. 3. Larva of do. 4. Larva of a Distoma. 5 and 6. Measle or Scolex of Tapeworm from a Pig. 7. Head of [illegible] *Cysticercus tenuicollis*. 13. Head of do. 14. Joint of Common Tapeworm, *Tænia solium*. 15. Head of do. 16. Joint of Broad Tapeworm [illegible] of [illegible] 22. Sepia. 23. Argonaute. 26. Nautilus, 27. Ammonite. 28 Ceratite. 29. Ancyloc[illegible] 40. Sea Hare.



...peworm. 8 and 9. Scolex from the lung cavity of the common Black Snail. 10. Saw Tapeworm. 11. Ovum of Tapeworm. 12. Thin-necked Hydatid ... 18. Joints of Swiss Tapeworm. 19 and 20. Scolex Colonies of the Hydatid of the Sheep. 21. Tapeworm of do 22. Tapeworm from the Intestine ... Unarmed. 31. Oxygyrus. 32. Firola. 33. Common Snail. 34. Arion. 35. Strombus. 36. Cerithium. 37. Cone. 38. Natica. 39. Keyh



1. Eolis. *2.* Elysia. *3.* Hyalea. *4.* Cho. *5.* Terebratulina. *6.* Lingula *7.* Spirifer. *8.* Pentamerus. *9.* Teredina or Boring Mussel. *14.* Venus Shell *15.* Heart Cockle *16.* Painters Mussel (Unio pictorum). *17.* Pinna *18.* Pecten *19.* Crista *20.* Transparent Ascidian *28.* Warty Ascidian. *29.* Golden Botryllus. *30.* Lophopus crystallinus. *31.* Pedicellina



Lamp shell. 10. Teredo or Ship-worm. 11. Animal of the Panopæa australis. 12. Petricola pholadiformis. 13. Lithodomus
Interior of Shell of do. 20. Scallop Shell. 21. Spondylus. 22. Oyster. 23. Exogyra. 24 and 25. Salpa. 26. Perophora.
Echinus. 34. Synapta. 35. Cuvieria. 36. Sea Cucumber. 37. Heart Urchin. 38. Helmit Urchin. 39. Shield Urchin.

latter is the most typical and most persistent. From the scattered position of the nerve-centres in the Mollusca, and from the irregular manner in which they are distributed throughout the body, Professor Owen's name of *Heteroganglíata* (Greek *heteros*, irregular; *ganglion*, a knot) has been derived. And this disposition of the nerve centres, as already remarked, is to be regarded as highly characteristic, and distinctive of the Molluscan sub-kingdom. A perfect digestive system exists in all Mollusca. Other distinguishing features of Molluscous animals are found in the nature of the locomotive organs, which are soft, not articulated or jointed to the body, and which exist typically as single organs placed in the middle line of the body. The broad ventral foot of the snail, for example, illustrates this last character; and the 'foot' of Mollusca forms thus a highly characteristic part of the structure of these animals. The general symmetry of the Molluscan body is of a bilateral or two-sided description, but the body being more developed to one side than to the other, the median line or plane of the body is described as curved in its nature. Reproduction in Mollusca may be sexual or asexual—as by gemmation or budding; both processes being represented in some forms, as in Polyzoa. Hermaphrodism is common, although in higher Mollusca the sexes are usually situated in separate individuals. The 'foot' of Molluscs may be modified to perform various offices in the economy of its possessors. Thus in the Gasteropods, as familiarly seen in the snail, whelk, &c., the broad ventral fleshy 'foot' subserves a locomotive purpose. In Lamellibranchiates it may be very variously used. In the cockles the foot assumes a large development, and by its aid these forms can execute considerable leaps. The *Solenidæ*, or 'razor shells,' burrow swiftly in the sand by the action of the foot; whilst in the mussels, Pinna, &c., the organ is devoted to the secretion of the well-known 'beard' or *byssus* (Pl. CXXX.-CXXXI. fig. 17), a collection of strong fibrous threads by means of which these animals moor or fix themselves to rocks and stones. In some bivalves (for example, the oyster), in which the locomotive powers are in abeyance, the foot is of rudimentary nature. In the Pteropoda it is similarly of small size, and in the cuttle-fishes the foot is represented by the arms or tentacles surrounding the mouth. It is essentially a development of the muscles of the mantle or integument, and is borne in its most typical position on the ventral or lower aspect of the body. A heart may be wanting (as in Polyzoa), but when present the central organ of the circulation is situated dorsally—that is, on the back region of the mollusc, or superiorly to the digestive tract. Similarly the respiratory or breathing organs may not be distinctly specialized, and respiration may be carried on (as in Polyzoa) by means of the tentacles or organs of prehension surrounding the mouth. The latter orifice may, as in Brachiopods, be provided with two elongated *arms;* or as in Lamellibranchiates, may be furnished with four soft processes termed *palpi*. A masticatory apparatus, consisting of an elongated 'lingual ribbon,' or *odontophore*, provided with teeth, is found in Gasteropods and Pteropoda; and in some Gasteropoda, and in the cephalopods or cuttle-fishes, horny or calcareous jaws may also be found. A distinct stomach, intestine, and anus, are generally to be observed—the intestine, however, in some Brachiopods has not been traced to a termination in an anus. The alimentary canal of Mollusca is generally bent upon itself, so that the anal opening is situated close to the mouth. A well-developed liver exists in the majority of Mollusca, and salivary glands are usually present. Renal organs or kidneys are represented in the higher Molluscs at least. No system of absorbent vessels, as seen in vertebrates, exists, whereby the digested matters are carried from the alimentary tract to the circulation. In Molluscs, as in lower forms, the products of the digestive function simply pass through the walls of the alimentary tract into the sinuses or spaces of the body, and thence gain admission to the great veins; or in some cases the products of digestion may pass more directly into the current of the blood. The blood of Mollusca is generally destitute of colour, and in all higher Molluscs is circulated throughout the body in a system of vessels connected with a central circulatory organ or heart. In these higher forms distinct arterial and venous vessels are to be discerned; although in many Molluscan forms the veins exist as large sinuses or spaces with ill-defined walls or boundaries. In higher Molluscs a well-developed heart is present, and consists of at least an auricle and ventricle. In function the molluscan heart is almost invariably systemic—that is, it is exclusively devoted to sending the pure blood from the breathing organs through the body, and has no part in returning the venous or impure blood to the respiratory surfaces as in the higher animals. In the cuttle-fishes certain supplementary contractile organs—branchial hearts—exist at the bases of the gills, and these structures perform the function of sending the venous blood into the gills to be purified. In addition to these branchial or venous hearts the cuttle-fishes possess a systemic heart corresponding in function to that of other Molluscs. In the lowest Molluscs (Polyzoa) a heart is entirely wanting; the circulation being represented by an undefined cyclosis or circulation of the fluid contents of the body, carried on mainly, if not entirely, by the action of vibratile filaments or 'cilia.' In Brachiopods the exact course and nature of the circulation has not been fully determined; but the existence of a rudimentary heart in most of these forms may be safely asserted. In the Tunicates, as last examples of lower Mollusca, a heart exists in the form of a simple contractile tube open at either end. And this structure exhibits a somewhat unusual mode of working, inasmuch as the course of the circulation is periodically reversed; the heart propelling the blood for so many pulsations in one direction, and then for as many in the opposite way. The typical breathing organs of higher Molluscs exist in the form of *gills* or *branchiæ;* and these organs are present in all classes of higher Mollusca. In the land Gasteropods (for example, snails and slugs) we find a terrestrial type of breathing represented; these latter forms possessing a *pulmonary sac* or *lung-chamber*, to which atmospheric air is admitted for the due aeration of the blood. The gills of Mollusca possess intimate structural relations with the mantle, and may be regarded as essentially consisting of portions of that structure functionally set aside or differentiated for the performance of the respiratory act. In lower Molluscs the breathing may be subserved by ciliated tentacles (Polyzoa); by a specialized branchial or respiratory sac (Tunicata); or by elongated 'arms,' assisted, in all probability, by the mantle (Brachiopoda). The type of nervous system in the higher Mollusca has already been described, as forming one of the distinctive features of the group; but as will presently be pointed out in noticing the classification of the group, certain Molluscs are regarded as belonging to a lower grade of molluscan organization from the inferiority of their nervous system, which consists, in such forms, of a single ganglionic mass only. The senses are present in comparative perfection in higher Mollusca. Eyes of a high type of structure are found in Cephalopods and Gasteropoda; and of a simpler type in Lamellibranchiates and Tunicates. But many forms are completely destitute of visual organs. Tentacles exercising the sense of touch are very generally de-

veloped. Auditory organs exist in Cephalopods and Gasteropoda; whilst the members of the former group are believed to possess olfactory organs also.

The Mollusca are divided into two primary sections, distinguished chiefly by the nature and relative degree of organization of the nervous system and heart. In the *Molluscoida* or *Lower Mollusca*, forming the first of these primary divisions, the nervous system exists in the form of a single ganglion or nerve mass, or of a chief pair of nerve-centres, with supplementary ganglia; and these are situated between the openings of the mouth and anus, being placed thus on the ventral or lower aspect of the body. The Lower Mollusca have, further, either no specialized heart, or at most a rudimentary one, consisting of a single chamber; they possess no 'foot' or muscular organ of motion: and exhibit in their reproductive history asexual modes of generation—such as germination or budding—whilst most are hermaphrodite. The Mollusca Proper, or Higher Mollusca, on the contrary, possess a nervous system consisting of the three chief ganglionic masses already described in noticing the characters of the nervous centres. They all possess a distinct heart consisting at least of two chambers—an auricle and ventricle. A muscular foot is generally developed; and the processes of reproduction are invariably sexual, whilst hermaphrodism is not so common as in the lower section of the group.

Classification.—In the Lower Molluscan group three classes are included—the Polyzoa, Tunicata, and Brachiopoda; the Mollusca proper form four classes—the Lamellibranchiata, Gasteropoda, Pteropoda, and Cephalopoda.

Class I. Polyzoa (Pl. CXXX.-CXXXI. figs. 30, 32, 33).—In this the first class of the Molluscoida, the familiar Sea-mats (*Flustræ*) are included, as well as a large number of allied organisms found in a living state in the sea and in fresh water, and obtained also in large quantities in a fossil condition. The class is defined firstly as including animals which invariably form *compound* colonies, hence the name *Polyzoa* (Greek, *polus* or *polys*, many; *zoön*, animal). From the plant-like appearance which most of these forms present the old name of *Bryozoa* (Greek, *bryon*, moss; *zoön*) was applied to the class. The Sea-mats cast up on our coasts after storms thus present an apt resemblance to masses of pale-brown sea-weed. The entire mass or colony (*polyzoarium*) of a polyzoön is made up of numerous little cells, each of which contains a separate individual, the *polypide* or *zoöid*. The cell is double-walled, and is filled with a clear fluid—the chylaqueous fluid. Within this fluid a simple digestive system—consisting of a mouth surrounded by hollow ciliated tentacles, an œsophagus or gullet, a stomach, and intestine—is suspended. And a marked feature in the organization of the Polyzoa consists in the fact that the upper part of the digestive system can be protruded at will by evagination, and withdrawn by invagination. No heart exists, but a circulation of fluid takes place within each cell through the movements of the minute vibratile filaments or *cilia*, which are borne on the inner lining of the cell. The nervous system exists in the form of a single nervous ganglion placed upon one side of the gullet. Muscles in connection with the protrusion of the mouth, &c., are well developed. Sexual reproductive organs (male and female) exist in each cell; but each *colony* in addition possesses the power of increasing itself by a process of continuous gemmation or 'budding.' The tentacles are borne on a disc or stage known as the *lophophore*, which is circular in form in nearly all the marine Polyzoa, but which is horse-shoe shaped or crescentic in most of the fresh-water forms.

The Polyzoa are divisible into the following two groups:—

Order 1. *Phylactolæmata.* Lophophore crescentic; mouth guarded by a valvular process, the 'epistome.' Example, Lophopus (fig. 30).

Order 2. *Gymnolæmata.* Lophophore circular; no epistome. Example, Urnatella, Paludicella, &c.

The Flustrae or Sea-mats, Pedicellina, and Rhabdopleura are familiar examples of marine genera; whilst Cristatella, Paludicella, Urnatella, and Lophopus are well-known fresh-water Polyzoa.

Class II. Tunicata.—The Tunicates or Ascidiæ Mollusca are so named from the fact of their bodies being inclosed in a sac or tunic with double walls, the outer of which, known as the *test*, is coriaceous or leathery in nature, and is chiefly composed of cellulose, a substance isomeric with ordinary vegetable starch. The inner wall or 'mantle' is soft and vascular. The upper part of the digestive system is not protrusible as in Polyzoa. The mouth opens at the lower part of a large *branchial* or *respiratory chamber*, the walls of which are composed of a net-work of blood-vessels. This chamber opens on the outer aspect of the body by an opening known as the oral or branchial aperture. The heart exists as a simple tube open at either end; and in the Tunicata the circulation of the blood is periodically reversed. These animals may exist either as simple and single animals, or may, like the Polyzoa, form compound colonies. The branchial opening is surrounded internally by a circle of tentacles, which are of small size and not ciliated. The gullet is continued from the mouth, and a stomach and intestine exist, the latter terminating in a chamber know as the *atrial* or *cloacal chamber*, which, like the branchial cavity, opens on the surface of the body by an aperture—the atrial aperture. Thus the body of a Tunicate has been not inaptly compared to a double-necked jar (fig. 28); the two necks or openings corresponding to the branchial and atrial apertures respectively. Water is admitted into the branchial chamber for the purpose of purifying the blood, which is brought to the numerous vessels of the chamber, and is thus exposed to the action of oxygen. The effete water, or that used in this process of respiration, is sent into the atrial chamber, lying parallel with the branchial sac, by the action of the vibratile cilia or filaments with which the walls of the latter chamber are provided. And from the atrial chamber the water which has been used in respiration and the effete matters of the digestive system, are expelled into the surrounding medium. The *jets d'eau* which these animals emit from the branchial and atrial apertures on being touched or irritated have procured for them their popular name of 'sea-squirts.' The single nervous ganglion is situated at the oral opening; and ocelli, or simple eye-spots placed between the tentacles, together with auditory or hearing capsules, constitute the organs of sense in the Tunicates. Reproduction in Tunicates takes place sexually, and by asexual modes also. These forms are all hermaphrodite. They exist firstly as simple and single individuals, a condition represented by the familiar *Ascidians* or Sea-squirts. Others are termed *social* Tunicates (for example, *Pedicellina*, fig. 31, and *Clavellina*), and consist of a colony composed of several individuals joined by root-like connecting processes or *stolons*. And lastly (as in *Botryllus*, fig. 29), we find examples of truly *compound* forms, in which the tests are fused together to form a truly composite mass. The *Salpidæ* (figs. 24, 25) exemplify Tunicata, which alternately assume a simple and social or compound condition. Thus a solitary Salpa, produced from an egg, developes, by a process of budding, chains of Salpæ, which remain connected together. And each

individual of a Salpa-chain in turn produces, by sexual processes, eggs, each of which gives origin to a solitary form with its subsequent process of budding. The Tunicates are divided as above into *simple*, *social*, and *compound* forms The *Ascidians* or Sea-squirts, *Clavellinæ*, *Botryllı*, and *Pyrosomidæ* respectively exemplify these divisions.

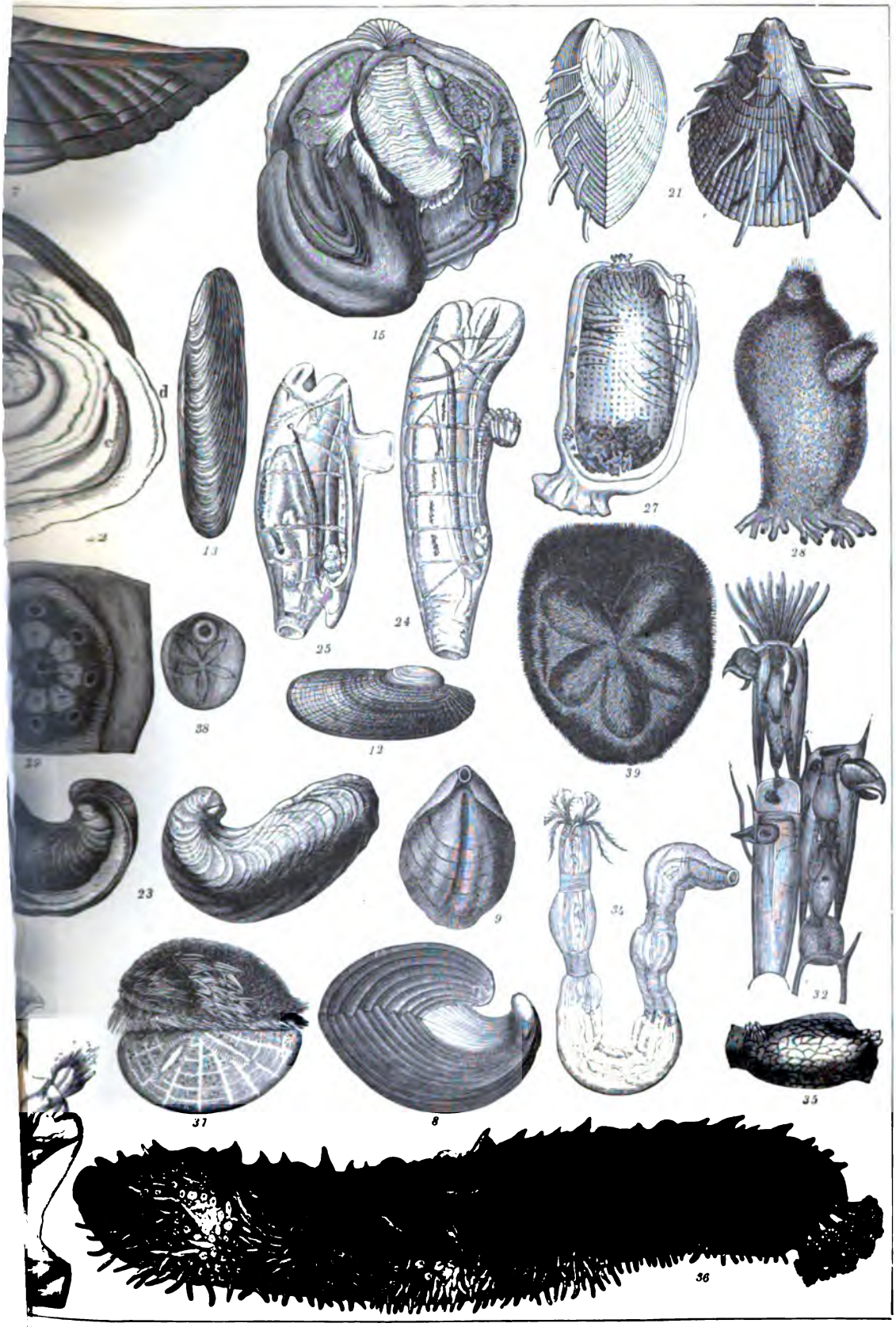
Class III. Brachiopoda (Pl. CXXX.–CXXXI. figs. 5, 6, 7, 8, 9).—This, the last class of the Lower Molluscs, is defined as including animals which are inclosed within a bivalve shell, lined by a mantle The possession of two long arms furnished with cirri or processes, and which stretch away from the sides of the mouth, is also a characteristic feature of the group, and one from which the class derives its name. All Brachiopods are solitary and simple forms. The halves or valves of the shell are respectively named dorsal (upper) and ventral (lower); they lie one on top of the other, and not side by side as in the Lamellibranchiata. The valves in some Brachiopods are joined or articulated by a hinge-joint; and those in which this structure is present are named *Articulata*. Those in which no hinge is present are termed *Inarticulata*. When a hinge exists the lower or ventral valve is generally perforated by an aperture (fig. 9) at its *beak* or prominent point, through which a muscular stalk or *peduncle* (fig. 6, *a*) passes; and by this structure the animal moors itself to fixed objects. In the Inarticulata the peduncle simply passes out between the valves of the shell. In some Brachiopods (for example *Crania*) no peduncle exists, and the shells are attached directly by the ventral valve to rocks, &c. In Articulata a curious series of twisted calcareous loops (fig. 5) are found within the upper valve. This structure is known as the 'carriage-spring apparatus,' and is developed for the support of the long arms characteristic of the class. These loops are wanting in Inarticulate Brachiopods. The valves of the shell are kept in apposition, and are both opened and shut by the action of special muscles. The Brachiopod shells being equally developed on each side of the middle line are said to be *equilateral;* but the ventral valve being generally the larger of the two halves, the shell is also *inequivalve*. In general form many Brachiopod shells bear a resemblance to the classical or Roman lamps, and hence the familiar name of 'Lamp-shells' by which they are sometimes known. The arms are highly muscular, and besides serving to draw particles of food towards the mouth they also subserve respiration in part or entirely. The old name of *Palliobranchiata* was applied to these forms from the erroneous idea that the mantle was the respiratory organ. A mouth, stomach, liver, and intestine exist. The latter in Articulate Brachiopods ends cœcally, no anus being demonstrable. In Inarticulata an anal opening is present. A heart of simple structure exists; but there are also several fusiform organs, two or four in number, connected with a system of tubes ramifying in the lobes of the mantle, and to which the name of *pseudo-hearts* has been applied. This latter system has some relation, in all probability, to the excretory functions or to the generative apparatus. The nervous ganglion exists below the gullet (*subœsophageal*). The Brachiopods are in some cases hermaphrodite, but in others the sexes are contained in distinct individuals. Reproduction is performed through sexual processes only; but the development has not as yet been clearly determined. The Brachiopoda all inhabit the sea.

The classification of the Brachiopoda is still a matter for discussion, our knowledge of the group being too limited to admit of any great advance being made in the taxonomy of the group. The class has been divided into the Articulate and Inarticulate orders. To the former group (the characters of which have already been mentioned in discussing the structure of the class) the families Terebratulidæ (see figs. 5 and 9), Spiriferidæ (fig. 7), Orthidæ, Rhynchonellidæ (fig. 8), and Thecididæ belong. The families Craniadæ, Productidæ, Discinidæ, and Lingulidæ (fig. 6) are examples of the Inarticulate Brachiopods. These forms, it may lastly be mentioned, are sparingly distributed in modern seas, but occur in vast numbers, and exhibit very many different species, in a fossil condition. They occur in some of the earliest fossiliferous rocks, and one genus, *Lingula* (which see), which appears in the Cambrian rocks, has persisted to the present day The Craniadæ, Discinidæ, and Rhynchonellidæ first appear in rocks of Silurian age, and still possess living representatives in modern seas. The period of the Silurian formations, from their great plenty of Brachiopod remains, has been denominated the 'Age of Brachiopods' by palæontologists.

HIGHER MOLLUSCA.

Class IV. Lamellibranchiata.—This class includes all our familiar bivalve shell-fish, such as the Oysters, Cockles, Mussels, &c. The lamellibranchiate shell is *equivalve*, its halves being equal in size; but it is *inequilateral*, being more developed to one side of the middle line than to the other. The valves further lie side by side or laterally, and not dorsally and ventrally, as in Brachiopods. The lamellibranchiate shell further is closed by the action of appropriate (*adductor*) muscles, whilst it is opened by the simple mechanical action of an elastic ligament placed at the hinge-line of the valves. The Lamellibranchiates inhabit both fresh and salt water. No distinct head is developed, hence they are occasionally spoken of as *Acephalous* Mollusca. The name of the group is derived from the possession of generally four lamellar or plate-like gills (Pl. CXXX.–CXXXI. fig. 22, *g*) placed two on each side of the body. The mouth is unprovided with any dental apparatus, and is surrounded by small fleshy lips (*c*), or labial tentacles. The stomach lies imbedded in the large mass of the liver. No salivary glands exist. The intestine passes through the ventricle of the heart, the anus opening close to the respiratory apertures. The heart may consist of two auricles and one ventricle (as in *Anodon*), or of a single auricle and ventricle, as in the oyster. In some cases two auricles and two ventricles may be developed —as is the case in the early or developmental history of these forms. The heart is purely *systemic*—that is, it is exclusively employed in sending the pure or arterial blood through the body or system: the auricles receiving the aerated blood from the gills, and the ventricle propelling it into the blood-vessels. The gills are contained within chambers formed by folds of the mantle. The gills may number two or four, but generally four exist. Each gill consists of two adherent plate-like structures, composed of a network membrane, the bars of which support and contain the blood-vessels, in which the blood is exposed to the action of the oxygen contained in the water, which is freely admitted to and allowed to circulate through the gill-structures. Water is admitted to the gills either by the simple unclosing of the valves or by means of special tubes termed *respiratory siphons* (figs. 10, 11), formed by elongations of the more or less united mantle-lobes. Through these siphons fresh water is brought to and the effete water ejected from the gills. The nervous system is constructed on the type of that already described as characteristic of the Higher Mollusca as a whole. Eye-spots exist around the margin of the mantle (as in the scallops); and a hearing-organ appears to exist in connection with the pedal ganglion. The muscular

1. Eolis. *2.* Elysia. *3.* Hyalea. *4.* Clio. *5.* Terebratulina. *6.* Lingula *7.* Spirifer. *8.* Pentamerus. *9.* Terebratula
oring Mussel. *14.* Venus Shell *15.* Heart Cockle *16.* Painters Mussel (Unio pictorum). *17.* Pinna *18.* Pecten *19.* Crania
parent Ascidian *25.* Warty Ascidian. *29.* Golden Botryllus. *30.* Lophopus crystallinus. *31.* Pedicellina



Lamp shell. 10. Teredo or Ship worm. 11. Animal of the Panopea australis. 12. Petricola pholadiformis. 13. Lithodomus
Interior of Shell of do. 20. Scallop Shell. 21. Spondylus. 22. Oyster. 23. Exogyra. 24 and 25 Salpa. 26. Perophora.
Echata 34. Synapta. 35. Cuvieria. 36. Sea Cucumber. 37. Heart Urchin. 38. Helmit Urchin. 39. Shield Urchin.

latter is the most typical and most persistent. From the scattered position of the nerve-centres in the Mollusca, and from the irregular manner in which they are distributed throughout the body, Professor Owen's name of *Heteroganglíata* (Greek *heteros*, irregular; *ganglion*, a knot) has been derived. And this disposition of the nerve centres, as already remarked, is to be regarded as highly characteristic, and distinctive of the Molluscan sub-kingdom. A perfect digestive system exists in all Mollusca. Other distinguishing features of Molluscous animals are found in the nature of the locomotive organs, which are soft, not articulated or jointed to the body, and which exist typically as single organs placed in the middle line of the body. The broad ventral foot of the snail, for example, illustrates this last character; and the 'foot' of Mollusca forms thus a highly characteristic part of the structure of these animals. The general symmetry of the Molluscan body is of a bilateral or two-sided description, but the body being more developed to one side than to the other, the median line or plane of the body is described as curved in its nature. Reproduction in Mollusca may be sexual or asexual—as by gemmation or budding; both processes being represented in some forms, as in Polyzoa. Hermaphrodism is common, although in higher Mollusca the sexes are usually situated in separate individuals. The 'foot' of Molluscs may be modified to perform various offices in the economy of its possessors. Thus in the Gasteropods, as familiarly seen in the snail, whelk, &c., the broad ventral fleshy 'foot' subserves a locomotive purpose. In Lamellibranchiates it may be very variously used. In the cockles the foot assumes a large development, and by its aid these forms can execute considerable leaps. The *Solenidæ*, or 'razor shells,' burrow swiftly in the sand by the action of the foot; whilst in the mussels, Pinna, &c., the organ is devoted to the secretion of the well-known 'beard' or *byssus* (Pl. CXXX.-CXXXI. fig. 17), a collection of strong fibrous threads by means of which these animals moor or fix themselves to rocks and stones. In some bivalves (for example, the oyster), in which the locomotive powers are in abeyance, the foot is of rudimentary nature. In the Pteropoda it is similarly of small size, and in the cuttle-fishes the foot is represented by the arms or tentacles surrounding the mouth. It is essentially a development of the muscles of the mantle or integument, and is borne in its most typical position on the ventral or lower aspect of the body. A heart may be wanting (as in Polyzoa), but when present the central organ of the circulation is situated dorsally—that is, on the back region of the mollusc, or superiorly to the digestive tract. Similarly the respiratory or breathing organs may not be distinctly specialized, and respiration may be carried on (as in Polyzoa) by means of the tentacles or organs of prehension surrounding the mouth. The latter orifice may, as in Brachiopoda, be provided with two elongated *arms;* or as in Lamellibranchiates, may be furnished with four soft processes termed *palpi*. A masticatory apparatus, consisting of an elongated 'lingual ribbon,' or *odontophore*, provided with teeth, is found in Gasteropods and Pteropoda; and in some Gasteropoda, and in the cephalopods or cuttle-fishes, horny or calcareous jaws may also be found. A distinct stomach, intestine, and anus, are generally to be observed—the intestine, however, in some Brachiopods has not been traced to a termination in an anus. The alimentary canal of Mollusca is generally bent upon itself, so that the anal opening is situated close to the mouth. A well-developed liver exists in the majority of Mollusca, and salivary glands are usually present. Renal organs or kidneys are represented in the higher Molluscs at least. No system of absorbent vessels, as seen in vertebrates, exists, whereby the digested matters are carried from the alimentary tract to the circulation. In Molluscs, as in lower forms, the products of the digestive function simply pass through the walls of the alimentary tract into the sinuses or spaces of the body, and thence gain admission to the great veins; or in some cases the products of digestion may pass more directly into the current of the blood. The blood of Mollusca is generally destitute of colour, and in all higher Molluscs is circulated throughout the body in a system of vessels connected with a central circulatory organ or heart. In these higher forms distinct arterial and venous vessels are to be discerned; although in many Molluscan forms the veins exist as large sinuses or spaces with ill-defined walls or boundaries. In higher Molluscs a well-developed heart is present, and consists of at least an auricle and ventricle. In function the molluscan heart is almost invariably systemic—that is, it is exclusively devoted to sending the pure blood from the breathing organs through the body, and has no part in returning the venous or impure blood to the respiratory surfaces as in the higher animals. In the cuttle-fishes certain supplementary contractile organs—branchial hearts—exist at the bases of the gills, and these structures perform the function of sending the venous blood into the gills to be purified. In addition to these branchial or venous hearts the cuttle-fishes possess a systemic heart corresponding in function to that of other Molluscs. In the lowest Molluscs (Polyzoa) a heart is entirely wanting; the circulation being represented by an undefined cyclosis or circulation of the fluid contents of the body, carried on mainly, if not entirely, by the action of vibratile filaments or 'cilia.' In Brachiopods the exact course and nature of the circulation has not been fully determined; but the existence of a rudimentary heart in most of these forms may be safely asserted. In the Tunicates, as last examples of lower Mollusca, a heart exists in the form of a simple contractile tube open at either end. And this structure exhibits a somewhat unusual mode of working, inasmuch as the course of the circulation is periodically reversed; the heart propelling the blood for so many pulsations in one direction, and then for as many in the opposite way. The typical breathing organs of higher Molluscs exist in the form of *gills* or *branchiæ;* and these organs are present in all classes of higher Mollusca. In the land Gasteropods (for example, snails and slugs) we find a terrestrial type of breathing represented; these latter forms possessing a *pulmonary sac* or *lung-chamber*, to which atmospheric air is admitted for the due aeration of the blood. The gills of Mollusca possess intimate structural relations with the mantle, and may be regarded as essentially consisting of portions of that structure functionally set aside or differentiated for the performance of the respiratory act. In lower Molluscs the breathing may be subserved by ciliated tentacles (Polyzoa); by a specialized branchial or respiratory sac (Tunicata); or by elongated 'arms,' assisted, in all probability, by the mantle (Brachiopoda). The type of nervous system in the higher Mollusca has already been described, as forming one of the distinctive features of the group; but as will presently be pointed out in noticing the classification of the group, certain Molluscs are regarded as belonging to a lower grade of molluscan organization from the inferiority of their nervous system, which consists, in such forms, of a single ganglionic mass only. The senses are present in comparative perfection in higher Mollusca. Eyes of a high type of structure are found in Cephalopods and Gasteropoda; and of a simpler type in Lamellibranchiates and Tunicates. But many forms are completely destitute of visual organs. Tentacles exercising the sense of touch are very generally de-

Dominicans. The third permits neither the holding of real nor of personal property, as is the case with the Franciscans, and especially the Capuchins. The vow of chastity requires an entire abstinence from familiar intercourse with the other sex; and that of obedience entire compliance with the rules of the order and the commands of the superior.

MONASTIR, or BITOLIA, a city of European Turkey, in Macedonia, 400 miles west of Constantinople. It is built at the west edge of a fine plain, in a recess formed by two lofty mountains, and is intersected by a river, crossed by numerous bridges. The streets are wide and well-paved, and the houses neat and clean; the mosques and minarets, intermixed with cypress and willow foliage, give a picturesque appearance to the town; and the well-frequented bazaars are remarkably handsome, some of them entirely roofed over and lighted from above, while others are only partially sheltered, or semi-roofed with matting on poles. Being the central situation for all military operations relating to Albania, Macedonia, Thessaly, and Bosnia, it is a place of remarkable bustle and brilliancy. The majority of the inhabitants are Greeks and Bulgarians, the Turkish residents being mostly soldiers or officials. It has eleven mosques, and carries on a large trade with Constantinople, Saloniki, Vienna, and Trieste. Pop. about 40,000.

MONBODDO, LORD. See BURNET (JAMES).

MONCALIERI, a town in Italy, Piedmont, on a fertile slope above the right bank of the Po, 5 miles south of Turin. It is entered by two gates, is regularly built, and has a magnificent castle crowning a lofty height, a town-house with a fine colonnade, and two handsome churches. The chief industrial establishments are silk-mills, tile-works, and potteries. Pop. 4807.

MONCONTOUR, a village of France, in Vienne, about 25 miles north-west of Poictiers. Henry III., when duke of Anjou, defeated Coligny here in 1569. Pop. 720. See COLIGNY.

MONCRIEFF GUN-CARRIAGE. See GUN-CARRIAGE.

MONDAY (*moon* and *day;* Saxon, *Monandœg;* German, *Montag;* Latin, *lunæ dies;* all of the same signification), the second day of our week, formerly sacred to the moon.

MONDOVI, a town in Italy, Piedmont, in the province of Cuneo, 53 miles west of Genoa. It is walled, flanked with bastions, and defended by a dilapidated citadel. It is well built, and has a fine square of a hexagonal form, lined with handsome edifices, adorned with arcades. It is the see of a bishop, the seat of several important public offices, and has a cathedral, with fine paintings, and four other churches; a splendid episcopal palace, a royal college, diocesan seminary, a town-house, theatre, academy of music, a foundling and several other hospitals; manufactures of woollens, hats, tallow and wax candles, confectionery, majolica and earthenware, numerous silk and worsted mills, dye-works, tanneries, a trade in the above articles of manufacture, and in corn, wine, fruit, and timber. Here, April 22, 1796, the French, under Napoleon I., totally defeated the Sardinians, and secured an entrance for their army into Piedmont. In 1799 the French, under Soult, sacked Mondovi. Pop. 11,859.

MONEY. See CURRENCY.

MONEY, STANDARD OF. See CURRENCY.

MONGE, GASPARD, a celebrated mathematician and natural philosopher, born at Beaune, 10th May, 1746, studied in the colleges of the fathers of the oratory at Beaune and Lyons with such success that he became a teacher at the age of sixteen. He was afterwards employed at the military school of Mézières, where he assisted Bossut, the professor of mathematics, and afterwards Nollet, professor of physics, whom he succeeded. In 1780 he removed to Paris, on being admitted into the Academy of Sciences, and became the coadjutor of Bossut, in a course of lectures on hydrodynamics at the Louvre. He quitted Mézières entirely in 1783, on being appointed examiner of the marine, when he composed a Treatise on Statics, afterwards used for the École Polytechnique. In 1789, like other friends of freedom, Monge indulged in expectations of the regeneration of France. Through the influence of Condorcet he was made minister of the marine in 1792, and he held at the same time the portfolio of minister of war during the absence of General Servan with the army. He thus became a member of the executive council of government, in which capacity he signed the order for the execution of Louis XVI. Shortly after he resigned his functions, in consequence of which he was exposed to the persecution of the ruling party of the Jacobins, against which he successfully defended himself. He was then employed, together with other men of science, in improving the manufacture of gunpowder, and otherwise augmenting the military resources of the country. The École Normale was founded, with which Monge became connected; and he then published his Géométrie descriptive, one of his principal works. Together with Berthollet and Guyton Morveau, he principally contributed to the establishment of the École Polytechnique; after which, in 1796, he was commissioned to go to Italy, and collect the treasures of art and science from the countries conquered by the French; and the labours of Monge and his colleagues gave rise to the splendid assemblage of works of taste and genius, which for a time ornamented the halls of the Louvre. In 1798 he went with Bonaparte to Egypt, where he was again employed in the service of science. On his return to France he resumed his functions as professor at the École Polytechnique, in the success of which he greatly interested himself. Bonaparte bestowed on him the title of Comte de Péluse, made him grand cordon of the Legion of Honour, gave him an estate in Westphalia, and a little before he set out on his Russian expedition, a present of 200,000 francs. The fall of his benefactor involved him in misfortunes. He was expelled from the Institute in 1815, one of his sons-in-law was exiled, and he was deprived of all his employments. His faculties became disordered, and he died July 28, 1818. Besides the works above noticed, Monge published Description de l'Art de fabriquer les Canons (4to), and Application de l'Analyse à la Géométrie des Surfaces (4to), as well as numerous scientific papers. See Dupin's Essai Historique sur les Services et les Travaux Scientifiques de Monge (Paris, 1819).

MONGHYR, or MONGHIR, a district and town of India, presidency of Bengal, in the province of Bahar, and division of Bhágalpur. The district is 115 miles long from north to south; breadth, 60 miles; area, 3913 square miles. It lies chiefly along the left, but partly also along the right bank of the Ganges. The former or northern portion, constituting about two-thirds of the whole, is in general a low flat, in some places sandy, in others swampy and uncultivated, but containing large tracts of remarkable fertility. The southern portion possesses the same general character, but appears to be on the whole still more swampy and unsightly. The principal crops are rice and wheat, but barley, pulse, oil-seeds, opium, indigo, sugar, and tobacco are extensively grown, chiefly by means of irrigation. The inhabitants are very industrious, and turn their land to the best account, often raising three crops from it in a single year.

The town of Monghir stands on the right bank of the Ganges, 80 miles east of Patna. It is of considerable antiquity, and was fortified by a high brick wall with a deep ditch in front. It is now little more than a mere assemblage of mud huts, with exception of some handsome houses and bungalows belonging to Europeans. Monghir, owing to the salubrity of its climate, is a favourite residence of invalided military men and their families. Pop. 55,372; of the district, 1,969,774.

MONGOLIA, a vast region of the north-east of Asia, belonging nominally to the Chinese Empire, and situated between China Proper and Asiatic Russia, between 35° and 52° N. lat., and 82° and 123° E. lon.; estimated area, 1,400,000 square miles. The central portion, nearly a fourth of the whole, is occupied by Gobi, a great sandy desert with a few spots of pasture and brushwood. Other parts are intersected by lofty granitic chains, the principal of which are the Altai, the Thian-shan, the Khinghan, and the In-shan. The largest rivers are—in the north the Salenga, and in the south the Siramuren. The climate presents the opposite extremes of intense winter cold and summer heat. Agriculture is little attended to, and the inhabitants, depending chiefly on their cattle, lead a nomadic life. In religion they are Buddhists. Polygamy prevails among them, and divorces are frequent.

MONGOLS, a great nation in the north-east of Asia, which, after having been, at two different times in the middle ages, distinguished for its conquests, has been sunk for three centuries past in inactivity, and is now hardly known in Europe but by name. They correspond in most respects with that branch of the human family designated Turanian by recent ethnologists. (See the article ETHNOLOGY.) The early history of the Mongols is obscure. In the thirteenth century they spread their conquests and devastations from the depths of Northern Asia over Russia and other parts of Europe. They came from the regions which they now in part inhabit, Mongolia, north of the great wall of China. For their power and consequence they were indebted to the genius of a single extraordinary individual, Genghis or Gengis Khan, who having been, originally, merely the chief of a single Mongol horde, compelled the other hordes to submit to his power, and then, in 1206, conceived the bold plan of conquering the whole earth. (See GENGIS KHAN.) After the death of Genghis Khan, in 1227, his sons pursued his conquests, subjugated all China, subverted the caliphate of Bagdad, and made the Seljook sultans of Iconium tributary. In 1237 a Mongol army again invaded Russia, conquered Moscow, and desolated a great portion of the country. Having subjugated Russia, the Mongols entered Poland in 1240, burned Cracow, and advanced in Silesia to Liegnitz, where they conquered Henry, Duke of Breslau, in a bloody battle, April 9, 1241. But want of provisions soon compelled them to leave the countries which they had laid waste with fire and sword. In Germany, and even France, where the former invasions of the Huns were held in remembrance, the fear of them was so great, that fasts and prayers were appointed to avert their approach. They were prevented from taking advantage of the general consternation to extend their conquests, by the disputes which arose respecting the succession to the throne, after the death of Khan Octai, the immediate successor of Genghis Khan. The empire of the Mongols still held together, and at the end of the thirteenth century was at the summit of its power. At that time it extended from the Chinese Sea and from India far into the interior of Siberia, and to the frontiers of Poland. The principal seat of the great khan was China; the other countries were governed by subordinate khans, all of whom were descended from Genghis, and were more or less dependent on the great khan. The most powerful of the Mongols were the Kaptchaks, who lived on the Volga, and were the scourges of Russia; and the Jagatais, who lived on the river Oxus. But this division of the empire among several petty princes was the cause of the gradual decay of the power and consequence of the Mongols in the fourteenth century. In the fifteenth century various hordes of this nation were subjugated or destroyed by the Russians, whose conquerors they had previously been. In China the empire of the Mongols had been overturned in 1368, by a revolution. But about 1369 there appeared a second formidable warrior of the tribe of the Jagatai, Timurlenk (Tamerlane), called also Timur Beg. He was of obscure descent, and raised himself by his talents and courage to the sovereignty of the whole nation. In 1369 he chose the city of Samarcand for the seat of his new government. The other Mongol tribes, with Persia, Central Asia, and Hindustan, were successively subjugated by him. In 1400 he attacked, in Asia Minor, the Sultan Bajazet I., who had been hitherto victorious against the Christians in Europe, and before whom Constantinople trembled. The battle of Ancyra (Angora), 1402, was decided against Bajazet; he suffered a total defeat, and was even made prisoner by Timur. For a time the Christian powers were thus freed from a formidable enemy. After Timur had conquered and desolated Asia Minor, he died on an expedition to China, February 19, 1405. After his death the monarchy of the Mongols was divided into several states. Baber (Babur), a descendant of Timur, founded in India, in 1519, a powerful monarchy, which existed till the close of the eighteenth century, as the empire of the Great Mogul. (See INDIA.) After the commencement of the sixteenth century the Mongols lost all importance in the history of the world, became split up into a number of separate khanates and tribes, and to a large extent fell under the power of the neighbouring peoples, the Russians, Turks, Persians, and Manchoo rulers of China. It was only in Jagatai (Western Turkestan) that the Mongolian khans were able to maintain their independence; and there Khans who claim to be descended from Genghis Khan still rule in a kind of semi-independence. See D'Ohsson, Histoire des Mongols depuis Tchinguiz-Khan jusqu'à Timour-Lenc (Hague and Amsterdam, four vols. 1834–35), and Henry H. Howorth's History of the Mongols from the Ninth to the Nineteenth Century.

MONICA, ST., mother of St. Augustine, the most celebrated of the Latin fathers, was born in Africa, of Christian parents, in 332. She found herself, however, compelled to become the wife of a heathen named Patricius of Sebaste, who was so won by her pious example that he also at last embraced Christianity. With her sons Augustine and Navigius she undertook a voyage to Italy, and died 4th May, 337, at Ostia, where she was seized with illness on her return. Her remains were brought to Rome under Martin V. Her festival is 4th May.

MONITEUR, LE. On 5th May, 1789, a journal was commenced at Paris, the Gazette Nationale, ou le Moniteur Universel, which was intended to give an account of foreign events, but more especially of the doings of the national assembly. It was originated by the publisher, Charles Joseph Panckoucke, on the date mentioned, and became a daily paper on the 24th November following. It continued to appear throughout the stormy period of the revolution, and that of the Directory and Consulate, and on the 11th Nivose, year VIII. (December, 1800), was declared an official paper, being separated into

two departments, one of which received the designation of Actes du Gouvernement. Since that time it has, with the exception of a short interval, been the most important, and the only official journal of the French government. On January 1, 1811, it dropped the title Gazette Nationale, and retained only that of Moniteur Universel, which it has since borne. The government of the restoration retaining it as its official organ, the distinction remained between the official and non-official portions, an arrangement which continued to subsist through the régime of Louis Philippe, the Republic, and the administration of the Emperor Louis Napoleon. The Moniteur appears every day in a large folio sheet, often accompanied with supplements. It ceased to be official at the end of 1868, by the initiative of M. Rouher, and on 1st January, 1869, the Journal Officiel appeared. But the Moniteur still (1875) clings to the hope of becoming the official organ: and relying, it is supposed, on the probable re-establishment of the monarchy, it affects a pronounced hostility against the republic, and has consequently lost all reputation for independence and originality. From its age and the official position it held so long, and the interesting period of which it chronicles the transactions, the Moniteur has arrived at the position of a valuable historical record. Complete sets are rare, and sell at a high price. A great facility in consulting it is afforded by the Tables Chronologiques du Moniteur Universel (eight vols. Paris, 1825). See also Bidault's Notices Historiques et Bibliographiques sur la Collection et les Tables du Moniteur depuis son Origine jusqu'à ce jour (Paris, 1858).

MONITOR, the type of a family of Lizards (Varanidæ), which are allied in structure to the family of the true or typical lizards (Lacertidæ). These forms inhabit the eastern hemisphere exclusively, and are found in Egypt, the Eastern Archipelago, &c. The monitors are the largest of the Lizard order, some species, such as the *Varanus Niloticus* of the Nile and Egypt, attaining a length of 6 feet. The Varanidæ belong to the group of Fissilingua or Slender-tongued Lizards, the tongue being fleshy and protrusible. The abdomen and head are provided with scales of small size, and which are unlike the *scuta* or large scales of the Lacertidæ. The tail is long; compressed laterally in the aquatic, and cylindrical in the terrestrial forms, and possesses a sharp under ridge or keel. The limbs are well developed, the toes being provided with claws. The palate does not bear teeth, these structures being situated in a common groove or alveolus of the jaws; the monitors being thus known as Acrodont Lizards. (See Lizard.) The monitors generally inhabit the neighbourhood of rivers and lakes. The Nilotic Monitor above mentioned thus inhabits the banks of the Nile, and is believed to destroy the eggs of crocodiles. The *Varanus bivittatus* of Java occasionally measures 8 feet in length. The *Hydrosaurus Bellii* is an Australian form which swims with great facility. In habits the monitors are active. They feed upon the eggs of crocodiles, turtles, and those of aquatic birds; and they are also said to attack small fishes. The name is obtained from the Latin verb *moneo*, to warn; this appellation being derived from the belief formerly entertained that these lizards gave warning of the approach of crocodiles. (See Pl. CLV.-CLVI. fig. 15.) The fossil lizard Protorosaurus, from the middle Permian rocks, possessed teeth situated in distinct sockets, like those larger saurians the crocodiles; and the consideration of its structure has led palæontologists to the belief that it very closely resembled the living monitors. This fossil form, like many of the existing Varanidæ, appears to have been aquatic in its habits. It was 3 to 4 feet long.

MONITORIAL INSTRUCTION. See Mutual Instruction.

MONK. See Monastery and Orders (Religious).

MONK, George, Duke of Albemarle, an English military officer, distinguished in history for the prominent part he acted in the restoration of Charles II., was the son of Sir Thomas Monk. He was born at Potheridge, December 6, 1608. Entering into the army at an early age, he served under Sir Richard Grenville in an expedition to Spain, and in 1627 went to the Netherlands, where he was promoted to a captaincy. He was engaged in the unfortunate expedition of Charles I. against the Scots in 1639, at which period he was made lieutenant-colonel. On the rebellion taking place in Ireland he was sent thither as colonel to Lord Leicester's troops, and his services were rewarded with the post of governor of Dublin. Hostilities occurring between the king and the Parliament, Colonel Monk brought over his regiment to his majesty's assistance. He was appointed major-general in the Irish brigade; and being employed at the siege of Nantwich, was made a prisoner, and committed to custody in the Tower of London. He devoted his leisure to writing, and composed Observations on Military and Political Affairs, published not long after his death. Having been detained about three years in confinement, he accepted a commission from the Parliament, on condition of being employed only against the Irish insurgents. He distinguished himself repeatedly in this service; but, having made a treaty with the Catholic chieftain O'Neal, which gave offence to the English parliamentary government, he resigned his command, and returned to his estate. After the entire overthrow of the royal party Monk was employed with Cromwell in Scotland, and was present at the battle of Dunbar. His coadjutor returning to England, he was intrusted with the chief command. War taking place with the Dutch Republic, he engaged in the naval service, and in 1653, together with Admirals Blake and Dean, commanded in two engagements, in which they triumphed over the enemy, commanded by Admiral Tromp. On the re-establishment of peace Monk returned to Scotland in April, 1654, where, at the head of the English army, he maintained the authority of Cromwell in that country. On the decease of the protector, the resignation of power by his son, and the contest of parties which subsequently took place, he availed himself of the commanding situation which he occupied to crush the republicans, and promote the recall and restoration of the Stuart family to the throne, in the person of Charles II. The dukedom of Albemarle, the order of the Garter, and the office of privy-councillor, rewarded the loyalty of the restorer of Charles II. During the Dutch war Monk was again employed in the naval service, and in 1666 defeated the Dutch fleet commanded by Van Tromp and Admiral de Ruyter. He died January 3, 1670, and was buried in Westminster Abbey. He was married to a woman in low life, who maintained a complete ascendency over him. He is described by Guizot as a 'man capable of great things, though he had no greatness of soul.' His powers of dissimulation and reticence were unusually great.

MONKEYS, the popular name applied generally to the great mammalian order Quadrumana. (For figures of a number of monkeys see Pl. VI.–VII.) The general characters of quadrumanous mammals (see Quadrumana) are found in the hallux or great toe being opposable to the other digits of the foot, so that the feet become converted into 'hands.' The hallux or thumb may be absent, but when developed it is generally opposable to the other fingers; and

the animals thus come to possess 'four hands,' or are 'quadrumanous.' The teeth consist of two incisor or front teeth in each side of each jaw: the premolar, or false molars, vary in number. The true molars number three in each side of each jaw, the latter teeth being furnished with tubercles of various sizes and shapes, adapted for crushing fruits and vegetables. The canine teeth are generally strong and of large size. A *diastema* or interval exists in all Quadrumana—save the lemur *Tarsius*—between the lower canine and the first lower premolar tooth, and between the upper canine and outer incisor teeth; this interval admitting of the large canines being brought into apposition when the jaws are closed. Using the term 'monkey' as applied to all the Quadrumana, the present article may be devoted to a general description of the various divisions of the order. The special characters distinctive of these divisions will be given under the article QUADRUMANA; whilst in the articles APES and MAN the characters of one section of the order, and the distinctive points which separate man from the higher apes, are respectively treated.

The lower monkeys approach very near to the Carnivorous Mammalia in their general structure and habits. They are for the most part habitually quadripedal—that is, progressing on all fours—and rarely assuming the semi-erect posture; which latter is the nearest assumption of any ape to the erect position of man. These lower monkeys are exemplified by such forms as the Lemurs of Madagascar, popularly known as 'Fox-monkeys,' from their somewhat vulpine type of countenance. The lemurs, loris, and a curious form, the aye-aye of Madagascar, constitute the typical members of the lowest section of the monkeys. This section is known under the name of the *Strepsirhina*, a term derived from the Greek (*strepho*, I twist; *rhines*, nostrils); but these forms in some systems of classification are collectively named the *Prosimiæ*. The nostrils of these forms exhibit a curved or twisted appearance, and are situated at the extremity of the nose or snout. The muzzle is more prolonged in these forms than in any other monkeys. The teeth exhibit a definite arrangement. The incisors number generally six in each jaw, those of the lower jaw being generally elongated; whilst the molar teeth are provided with tubercles or processes, indicating an adaptation for a vegetable dietary. The second toe of the hind foot is furnished with a claw-like nail, and the thumbs and great toes being opposable the animals become thus truly quadrumanous. In their geographical distribution the monkeys exhibit certain important features which serve, together with other characters, to divide the order into natural groups. Thus the Strepsirhina have Madagascar as a centre of distribution, and from this central area these forms extend to the east or adjoining coast of the African mainland, and to the Eastern Archipelago in the opposite direction. The Aye-aye (*Cheiromys Madagascariensis*) exhibits so marked features of difference from the other members of its section that it forms the type of the first family of the group—that of the *Cheiromydæ*. In general form and appearance this monkey resembles a squirrel of large size. The body is covered by a hairy fur, and the tail is bushy. The fore and hind feet possess each five toes; the thumb being feebly opposable to the other digits, whilst the great toes are fully opposable. The fingers are provided with claw-like nails, and the toes are also furnished with claws, that of the second toe being much elongated. The third or middle finger is longer than the fourth digit, and is more slender than the other fingers. The last two joints of this finger are destitute of hair, and the animal is believed to use the member for the purpose of picking the insects on which it subsists from the bark of trees. In its dentition the aye-aye exhibits great deviations from the ordinary quadrumanous type, and approaches most nearly to that of the Rodentia. Thus there are only two incisor teeth in each jaw, and like these teeth in rodents they grow from persistent pulps, and possess a hard anterior layer of enamel. No canines exist, and eight molars with simple flat crowns are found in each jaw. The ears of the aye-aye are of large size and destitute of hairs. It is said to be nocturnal in its habits, and to be slow and inactive in its movements. Its diet, whilst chiefly of an insectivorous kind, is said also to include fruits and vegetable matter. There is but a single species known, and this form appears to be exclusively found in Madagascar. The lemurs (which see), including many species, form the type of the second family, *Lemuridæ*. The thumbs and great toes in these forms are opposable, and all the digits possess flat nails, with the exception of the second toe of the hind feet, which is provided with a long claw-like nail. The tail is long and furry. These forms are also confined to Madagascar, and are familiarly called 'Madagascar cats.' They are in general playful, and are readily domesticated. They range from the size of a small cat to about 3 feet in height—the Indri Lemur (*Indris brevicaudatus*) attaining these latter proportions. They are in general frugivorous animals, and represent the typical monkeys of Madagascar. In their dentition they nearly resemble other Quadrumana. Their dental formula includes four incisors, two canines, and ten or twelve molars in each jaw. The upper incisors are placed straight in the jaw, those of the lower jaw being placed slantingly in the mouth, and are prominent; whilst the incisors of opposite sides in both upper and lower jaws are usually separated by a distinct interval. The upper canines are long and pointed, the lower canines closely resembling the lower incisors, and being placed immediately beside the latter teeth, without any interval. The molar teeth generally possess sharp 'cusps,' like the corresponding teeth of insectivorous mammals. Amongst the most typical of the Lemur family may be mentioned the Indri, the Woolly Lemur (*Lemur laniger*), the Red Lemur (*L. ruber*), the Ring-tailed Lemur (*L. catta*), White-fronted Lemur (*L. albifrons*), Black-fronted Lemur (*L. nigrifrons*), the Gray Lemur (*L. griseus*), the Potto (*Perodicticus Potto*), the Galago (*G. Senegalensis*, &c.), the Tarsius Lemur (*Tarsius spectrum*, &c.), &c. &c. The third and last family of the strepsirhine monkeys is that of the *Nycticebidæ*, which includes the Loris and Slow Lemurs. The tail in this group is rudimentary or wanting, the eyes are of large size and situated close to each other, and the ears are of small size. In their distribution the Nycticebidæ are more widely spread than their neighbours, these forms being found in Southern Asia and in the Eastern Archipelago. The Slow-paced Loris (*Nycticebus tardigradus*) of Hindustan, Ceylon, and Java; and the Slender Loris (*L. gracilis*) of India and Ceylon, are the two most familiar forms.

The *Platyrhina* (Greek, *platus*, broad; and *rhines*), or New World Monkeys, form the second of the great natural sections into which the monkeys are arranged. These latter forms are entirely confined to South America, and have their head-quarters of distribution in the great Brazilian forests. The first character of the Platyrhines is found in the specially prehensile nature of the tails of most of these forms; this appendage being so well adapted to assist in their arboreal life that it has been appropriately designated a 'fifth hand.' By its aid these monkeys suspend themselves from the branches of trees, whilst

hands and feet are left free and unimpeded to grasp objects. These monkeys, like the preceding forms, are essentially four-footed as regards their posture, although they may sometimes temporarily assume the erect posture. The spider monkeys may thus occasionally imitate the natural position of man. The nostrils are widely separated, and situated close to the tip of the snout—the broad character of the septum, or partition between the nostrils, giving the section its distinctive name. The ears are of rounded shape and destitute of hairs; and in the Platyrhina there are none of the cheek-pouches or hard callosities on the rump (*natal and ischial callosities*), so characteristic of Old World monkeys. The hind limbs are generally the longer in this section. In the spider monkeys, however, the fore-limbs are longer than the hinder members. The thumbs are not generally opposable, and may be wanting; and the thumb in these monkeys more nearly approaches the other fingers in size and form. Unlike other monkeys, the Platyrhina have the thumb placed in nearly the same plane as the other fingers, so that the mere position of the thumb renders it unfitted to constitute the hand a prehensile organ. The great toe is generally of large size, and is more capable of being opposed to the other digits than the thumb. The general dentition exhibits four incisors, two canines, six premolars, and six molar teeth in each jaw. The latter teeth are provided with blunt cusps. The diet is especially of a vegetable nature. Two families are included in the platyrhine section. The *Hapalidæ*, or Marmosets, form a group the members of which are of small size, and resemble squirrels in general appearance. They are invariably quadripedal. The ears are hairy and of large size. The body is covered by a close fur, and the tail is long and also furry, but never prehensile. The marmosets feed on fruits and insects. Their dental formula gives four incisors, two canines, six premolars, and four molars in each jaw—this dentition resembling that of the Catarhine or Old World Monkeys, and also that of man himself. The molars are provided with blunt processes. Neither the thumbs nor the great toes are perfectly opposable, and hence, as remarked, these forms are not, strictly speaking, entitled to be termed 'quadrumanous.' The marmosets are readily tamed, and appear to be of an inoffensive disposition, even in a wild state. The Common or Tufted Marmoset (*Hapale penicillata*), the Leonine Marmoset or Tamarin (*H. chrysomelas*), the Silky Tamarin (*H. rosalia*), the Pinche (*H. œdipus*), the Negro Tamarin (*H. ursula*), Buffon's Marmoset (*H. Jacchus*), &c. &c., are a few familiar forms out of very many other species. The *Cebidæ* form the remaining family of the Platyrhina, and possess a dentition agreeing with that already mentioned as typical of the section. The face is generally naked, but may be whiskered; and although the tail is prehensile in the great majority of cases, and has the under surface of its extremity destitute of hairs, yet in some few cases it is non-prehensile and hairy. In none is the tail wanting or rudimentary. The thumb is never opposable, and may be undeveloped, as in the spider monkeys. The diet is partly vegetable and partly insectivorous in nature. Of the *Cebidæ* the well-known Spider Monkeys (*Ateles*) present very typical examples. In these forms the tail reaches its greatest development as a prehensile organ. The limbs are exceedingly slender, and the thumb is rudimentary. The *Ateles arachnoides* or Brown Coaita, the Cayou (*A. ater*), the Coaita (*A. paniscus*), the Chuva (*A. marginatus*), are familiar members of this genus. The Capuchin Monkeys, or Sapajous, form the type of the genus *Cebus*, and include many species, among which may be mentioned the Capuchin (*Cebus capucinus*), the Brown Sajou (*C. apella*), the Varied Sajou (*C. variegatus*), the Hooded Sajou (*C. frontatus*). The Squirrel Monkeys (*Callithrix*) similarly number many species and varieties. The typical species is the *Callithrix sciureus;* and the Masked Callithrix (*C. personatus*) and the Collared species (*C. torquatus*) may also be mentioned as well-known forms. The Howling Monkeys (*Mycetes*) are so named from the loud howling noises they are capable of producing, through the possession of a bony 'drum,' which opens into the larynx, and which greatly increases the resonance of the voice. The Ursine Howler (*M. ursinus*) and the Guariba (*M. fuscus*) exemplify this genus. The Saki genus (*Pithecia*) includes several species with non-prehensile tails, of which the *P. sagulata* (the Couxio of Traill) and the Monk (*P. Monachus*) are good examples. The genus *Chiropotes* is also included in the family Cebidæ.

The last and highest section of the monkeys is that of the *Catarhina* (Greek, *kata*, downwards; and *rhines* or Old World Monkeys, which includes those apes that most nearly approach the human type of structure. The Catarhine Monkeys are distinguished by their obliquely-set nostrils, the nasal apertures being placed close together, and the nasal septum being narrow. Opposable thumbs and great toes exist in all, except the genus *Colobus*, the members of which want thumbs. The teeth are arranged to exhibit four incisors, two canines, four premolars, and six molars in each jaw; the incisors are prominent, and the canines are especially large and strong—the latter teeth being separated by an interval or diastema from the upper outer incisor, and from the first lower premolar. The tail may be rudimentary or wanting, but in no case is it prehensile. Cheek-pouches, or pocket-like cavities excavated in the cheeks, and which are used as receptacles for food preparatory to its mastication, are present in many catarhine monkeys; and the skin covering the prominences of the buttocks, or tuberosities of the ischial bones is frequently destitute of hair, becomes hardened, and thus constitutes the so-called *natal callosities* of these animals. Sometimes these callosities exhibit brilliant colours, and the skin in the neighbourhood of the nose, as in the mandrill, may also be striped with gay hues. In their distribution all the catarhine monkeys inhabit Asia and Africa, with the exception of a macaque monkey inhabiting the Rock of Gibraltar, and which belongs to the species of Barbary Apes (*Macacus Inuus*). This species, the only wild European form, is believed to have sprung from domesticated Barbary apes brought from the north African coast. Two groups, according to some authorities, are to be discerned in the Catarhine section. The *Cynomorpha*, or lower Catarhine Apes, in which a tail exists, and which are habitually four-footed in their mode of progression. These forms possess natal callosities, which may be brilliantly coloured. To this group belong the genera *Semnopithecus* (Indian Monkeys), *Cynocephalus* (Baboons), *Colobus*, *Cercopithecus* (Guenons), *Macacus* (Macaques), and *Papio* (Mandrills). The *Anthropomorphous Catarhina*, or Man-like Apes, include the highest of the Quadrumana, and are represented by the genera *Hylobates* (Gibbons), *Pithecus* (Orangs), and *Troglodytes* (Gorillas and Chimpanzees). A simpler arrangement divides the Catarhina into three tribes, of which the first is characterized by the included forms possessing cheek-pouches, natal callosities, and a well-developed tail. The *Semnopitheci*, found in India and Asia generally, are typical examples of this group, the most familiar species of this genus being the *Semnopithecus entellus*, or 'Sacred Monkey' of the Hindus; the Snowy Monkey (*S. pruinosus*); the Proboscis Monkey, or Kahau (*Semnopithecus*

or *Presbytis Nasalis*); and the Negro Monkey (*S. Maurus*). The genus *Colobus* of Africa is distinguished by its being the only Catarhine Monkey which has a rudimentary or abortive thumb. The African genus *Cercopithecus* (Guenons) also includes familiar monkeys such as the Diana Monkey (*C. Diana*), the Mona (*C. Mona*), the Patas (*C. ruber*). Allied to the preceding we find the genus *Cercocebus*. And the last group of this first section or tribe is formed by the Macaques of Asia, of which genus the Wanderoo (*M. silenus*), the Rhesus Monkey (*M. rhesus*), the Bear Monkey (*M. ursinus*), the Toque (*M. radiatus*), and the Red-faced Macaque (*M. speciosus*), are familiar species. The Baboons and Mandrills form the second tribe of the Catarhina, and are distinguished by their abortive tails, the prolonged dog-like muzzle, the large brightly-coloured callosities, their quadrupedal habits, and by their generally large size. The Baboons are among the most ferocious of the monkey order, and chiefly inhabit Africa. The Common Baboon (*Cynocephalus papio*) is a well-known form, as also is the Chacma (*C. porcarius*). The Derrias (*C. Hamadryas*), the Mandril (*C.* or *Papio Mormon*), and the Drill (*P. leucopheus*), form the remaining species of this tribe, these latter being found principally in Africa, although the Derrias also occurs in Arabia. The last tribe of Anthropoid Apes is represented, firstly, by the Gibbons of Eastern Asia, of which genus the Sumatran Siamang (*Hylobates syndactylus*), the Common Gibbon (*H. lar*), the Hoolock (*H. hoolock*), and the Agile Gibbon (*H. agilis*), are good examples. The Gibbons possess natal callosities, the fore-limbs are proportionally long, and the tail is absent. All the anthropoid apes have rudimentary tails. They all want cheek-pouches, whilst in most natal callosities are absent. The attitude of these apes is generally of a semi-erect kind, the hind legs being generally shorter than the fore-limbs. The canine teeth of the males especially are strong and prominent. The Orangs, forming the second anthropoid genus, have no cheek-pouches, callosities, or tail. The typical Orang (*Simia satyrus*) is found in Sumatra and Borneo, and attains a height of 4 or even 5 feet. The Chimpanzee (*Troglodytes niger*) of Western Africa possesses proportionally shorter arms than the preceding apes. The ears are of large size. The face and hands are destitute of hair. The Gorilla (*Troglodytes Gorilla*), on the whole the most anthropoid of the apes, inhabits Lower Guinea and Central Africa. The hind limbs are relatively short in this form, which attains an average height of 5 feet. It is an exceedingly powerful animal, and is fierce and untameable in disposition. The ears are of small size, and the animal appears to assume the semi-erect posture with comparative ease. For further and more specific details regarding the monkey class, see articles APES, BABOON, MAMMALIA, MAN, QUADRUMANA, &c.

MONK-FISH, or ANGEL-FISH (*Squatina angelus*), a genus of the family Squatinidæ, which is included in the order Elasmobranchii, or that of the Sharks and Rays. The Squatinidæ appear to be somewhat intermediate between the Sharks and Rays, and possess a flattened body, with large and expanded pectoral and ventral fins. No anal fin exists. The eyes are borne on the upper surface of the broad head, as also are two openings termed 'spiracles,' through which water may be admitted to the gill-sacs. The mouth is wide, and placed on the under aspect of the head. The branchial or gill slits are of large size. Two dorsal or back fins are present, and the tail fin is more nearly symmetrical than in allied forms. The angel-fish is found in British seas, and in those of Europe generally. It derives its name of 'monk-fish' from the somewhat hooded appearance of the head, produced by expansions of the integument and pectoral fins. In some localities it gains the name of 'fiddle-fish' from its appearance. A Mediterranean species (*S. aculeata*) is distinguished by possessing a row of strong dorsal spines. The monk-fish may attain a length of 5 or 6 feet. It is voracious in habits, feeding upon other fishes, and generally swimming near the ground. The skin, with its 'placoid' scales, affords a kind of shagreen-material, used in polishing cabinets.

MONK'S-HOOD. See ACONITE.

MONMOUTH, or MONMOUTHSHIRE, a maritime county of England, bounded on the north by the counties of Hereford and Brecknock, on the west by the latter and Glamorgan, on the south and south-east by the estuary of the Severn, on the east by Gloucester; area, 370,350 acres, of which about 270,000 acres are arable, meadow, and pasture. Surface much diversified, a considerable portion being mountainous and rocky; the remainder consisting of fertile valleys and gentle slopes, adorned with woods and pastures, and highly cultivated fields. The geological formations are the old red sandstone east of the Usk, and the coal measures of the South Wales coal-field west of the Usk, skirted by a narrow band of carboniferous limestone. The most important mineral productions are iron, coal, limestone, and various other kinds of stone, valuable for building and other purposes. The production of coal and iron in the county is extensive, there being over 120 collieries, and over 50 blast-furnaces, many puddling furnaces, steel-works, and rolling-mills. Pontypool, Blaenavon, Tredegar, Cwmbran, Ebbwvale, and Rhymney, are the headquarters of the coal and iron industries. The manufacture of tin-plate is also extensively carried on. The soil is generally good. Wheat, barley, and oats are the chief corn crops, and small orchards are numerous. In 1883, 32,595 acres were under corn crops, 13,589 being wheat, and 8012 barley; 11,921 acres were under green crops, and 15,001 under clover and grasses in rotation; permanent pasture, 178,920 acres. The cattle numbered 45,232, sheep 145,308, agricultural horses 6367. Flannel is manufactured, as are also a few coarse cloths. It was made an English county by Henry VIII. Monmouth contains the beautiful ecclesiastical remains of Llanthony and Tintern Abbeys. It returns two members to Parliament. Chief towns, Monmouth (capital), Newport, Pontypool, Abergavenny, Chepstow, Abertillery, Blaenavon, and Tredegar. Pop. in 1871, 195,448; in 1881, 211,267.

MONMOUTH, a parliamentary and municipal borough and market town of England, capital of the above county, in a beautiful valley at the confluence of the Monnow and Wye, the former here crossed by an ancient and the latter by a handsome modern stone bridge, and on the railway to Hereford, 27 miles W.S.W. of Gloucester. It consists of a spacious street, leading through an ancient arched gate at the Monnow Bridge to the market-place, and of several other streets diverging in different directions; and has a parish church, with an elegant spire 210 feet high; various other places of worship, a free grammar-school; a handsome range of almhouses; and a handsome market-house; malleable iron and tin-plate works, paper and corn mills; a considerable trade in steel, tin-plate, and paper. The castle, of which some portions still remain, was the favourite residence of John-of-Gaunt, Duke of Lancaster, and the birth-place of Henry V., and of the historian Geoffrey of Monmouth. Monmouth, with Newport and Usk, sends a member to Parliament. Pop. in 1881, 6111.

MONMOUTH, JAMES, DUKE OF, the natural son of Lucy Walters one of the mistresses of Charles

[illegible] his father, the [illegible] that [illegible] for [illegible] the Duke. He was [illegible] Charles with [illegible] In Flanders he [illegible] After the Restoration he [illegible] Earl of Orkney and Duke of Monmouth, and received the Garter. In his twenty-first year he was married to a wealthy heiress. After the [illegible] of the Earl of Buccleuch. 'He possessed,' says Hume, 'all the qualities which could engage the affections of the populace—a distinguished valour, an affable address, a thoughtless generosity, a graceful person. He rose still higher in the public favour by reason of the universal hatred to which the Duke of York, on account of his religion, was exposed. Monmouth's capacity was mean; but it might perhaps, notwithstanding his great popularity, not have been dangerous had he not implicitly resigned himself to the guidance of Shaftesbury, a man of such a restless temper, such subtle wit, and such abandoned principles. That daring politician had flattered Monmouth with the hopes of succeeding to the crown.' This character explains his whole life. In 1670 he received the command against the Scotch Covenanters, whom he defeated at the battle of Bothwell Bridge, but was deprived of his command and sent out of the kingdom the same year, to quiet the fears of the Duke of York. He soon after returned, and engaged in several conspiracies with Sidney, Shaftesbury, and other leaders, some of whom were desirous of establishing a republic; others merely wished to exclude the Duke of York; while Monmouth entertained secret hopes of acquiring the crown. One of these plots, some of the parties to which were also concerned in the Rye-house plot, being discovered in 1683, Monmouth concealed himself for some time, but was afterwards pardoned on expressing his penitence. No sooner had he obtained his pardon than he disavowed having made any concessions to the court, and was, in consequence, ordered by Charles to depart from the kingdom. On the accession of James II., Monmouth, finding himself pursued by the king's severity, was induced, contrary to his judgment and inclination, by the impatience of some of his partisans, to attempt an invasion of England. He arrived at Lyme with hardly a hundred followers (June 11, 1685); but his numbers were soon increased, and he assumed the title of king as James II., and asserted the legitimacy of his birth. His forces were defeated at Sedgemoor, Bridgewater, 5th July, and the duke himself was made prisoner, having been found in the disguise of a peasant lying at the bottom of a ditch, overcome with hunger, fatigue, and anxiety. He betrayed much pusillanimity before his uncle, but conducted himself with much firmness on the scaffold, where his head was severed from his body, after four unsuccessful blows, 15th July, 1685. A fearful retribution awaited those who had participated in his rebellion in the 'Bloody Assize,' commenced under the infamous Judge Jeffreys, whose cruelty and brutality have become proverbial as the disgrace of English judicature.

MONOCHORD, a musical instrument with one string, invented by Pythagoras, and much employed by the ancients in the musical training of the voice and ear. The modified form of the instrument used in natural philosophy lecture rooms is often called a *sonometer*: it consists of one or more strings stretched over a sounding-box. A string is fastened at one end of the box, and passes at the other end over a fixed pulley, which enables it to be stretched by means of weights; it passes over two fixed bridges near the ends of the box, and there is a movable bridge between to alter the length of the vibrating portion of the string. Strings are employed to produce musical sounds in the violin, harp, guitar, piano, &c. The violin-string is caused to vibrate by drawing a bow of rosined hairs across it; during the motion of the bow the string is slightly drawn aside and allowed to slip a great many times; these disturbances travel along the string. Harp and guitar strings are plucked with the finger: piano-strings are struck with a little leather-faced hammer. In all these cases the pitch of the musical sound produced, or the number of vibrations of the string per second, depends on the rate at which a disturbance can travel backwards and forwards from one end to the other, and is therefore governed by the length of the vibrating part of the string, its diameter, density, and tension. The law,

$$n = \frac{1}{2l}\sqrt{\frac{t}{m}},$$

where n is the number of complete vibrations per second, l the length of the vibrating string, t its tension, and m its mass per unit length, may be proved by means of the sonometer, if the experimenter has it in his power to determine the pitch of a musical note, by varying the stretching weights and the position of the movable bridge, and by using strings of different sizes and densities. The sonometer is an indispensable piece of apparatus to lecturers on acoustics, not only for the proof of the law of vibrating strings, but also to illustrate the relations of harmonics and the fundamental ideas of undulations.

MONOCHROMATIC LIGHT, light of one particular colour, that is, light whose spectrum has only one bright line. The yellow light of sodium vapour is monochromatic; it is often employed in spectroscopic experiments.

MONOCHROME (Greek, *monos*, single, and *chroma*, colour), in ancient painting, a painting executed in a single colour. This description of art is very ancient, and was known to the Etruscans. The first specimens of the art of painting were of one tint only, which was most commonly red, made either with cinnabar or minium. Instead of red, white paint was sometimes used. Quintilian says of Polygnotus, and Pliny of Zeuxis, that their performances of this kind were of the latter description. The antique tombs of the Tarquins, in the neighbourhood of Corneto, offer several figures painted in white upon a dark ground. The first four plates in the first volume of the paintings of Herculaneum contain several monochromes upon marble. The most numerous monuments existing of this kind of painting are on terra cotta. A painting, to be a proper monochrome, must be relieved by light and shade. Hence the skiagram or silhouette, though executed in a single colour, is not a monochrome.

MONOCOTYLEDONOUS PLANTS. See Botany.

MONODELPHIA (Greek, *monos*, single; *delphus*, womb), the name applied by De Blainville in 1816 in his system of mammalian classification, to the group of higher mammals, including man himself, and distinguished primarily by the fact that the uterus or womb is single, and shows a single uterine cavity: although its upper extremity or *fundus* may exhibit a division into two lobes known as the *cornua* or 'horns.' This single uterus opens into a single vagina, distinct from the rectum, but which may, however, be partially divided by a *septum* or partition. The Monodelphia never possess 'marsupial bones,' or those which support the characteristic 'pouch' of such lower forms as the kangaroos, &c. The testes of the males, when situated externally, and inclosed in a scrotum, are never placed in front of the penis, as in lower mam-

mals. The urinary bladder opens externally by a distinct urinary canal or *urethra*, which is separate from the rectum. The young are further retained within the womb for a considerable period, and when born are able to nourish themselves from the mammary glands of the parent; and in connection with their development there is always formed within the parental womb a vascular structure, the *placenta* (which see), through which the blood of the parent is brought to the embryo with a view to its nourishment whilst still *in utero*. These latter characters contrast clearly with the immature state of development in which the young of lower Mammalia are produced, and also with the absence in these latter forms of any structure corresponding to the placenta or 'after-birth' of the Monodelphia. This division of the Mammalia, therefore, corresponds with the *placental* division of Owen, and it includes all mammals, with the exception of the two lower orders, Monotremata (*Ornithodelphia* of De Blainville) and Marsupialia (*Didelphia*). The placenta of monodelphous Mammalia may either be completely thrown off from the maternal tissues at birth, when it is said to be *deciduate;* or none of the maternal tissues may be parted with on the birth of the young. In the latter case the placentation is termed *non-deciduate*. A final character of monodelphous mammals is found in the fact that the angle of the lower jaw is not inflected; and teeth are generally, though not universally, present.

MONOGRAM (*monos*, single or only, and *gramma*, meaning 'a single mark'), a character or cipher composed of one, two, or more letters interwoven, being a sort of abbreviation of a name, used as a seal or badge, in coats of arms, &c. Monograms were much used on coins, by the Romans, for instance, though they did not employ them on inscriptions; and were also used on standards, walls and tapestry, seals and documents; first on coins, latest on documents, in which they were employed not only by princes and ecclesiastical dignities, but also by magistrates and notaries. At the commencement of the Christian period their use was universal. The Roman *labarum* bore the monogram of Jesus Christ, which consisted of two letters, a P placed perpendicularly through the middle of an X, as we find it on many medals of the age of Constantine, these being the two first letters of the word ΧΡΙΣΤΟΣ. Under the Eastern Empire it is usual to find MIK, which forms the monogram of Mary, Jesus, Constantine. The use of monograms was exceedingly common upon Greek coins; and many antiquarians have bestowed much time and attention in the effort to decipher them—a useless labour, since a great number of these monograms were, without doubt, of a conventional nature, and understood only by a few, even in the times at which the coins were current. After the time of Charlemagne, who made much use of them, and improved their form, monograms became very common in all the countries which had belonged to the Frankish Empire. The love of combining and contorting letters and words flourished universally in the middle ages, and the exercise of this art helped to while away the solitude of the monastic cells. The titles and rubrics of Greek manuscripts are frequently monogrammatic, and numerous and diversified monograms are found in Latin manuscripts. Alphabets like the Roman, of an angular character, have many letters with corresponding parts; and the upright strokes, the horizontal lines, and the curves are easily made by arranging them so that the similar portions shall coincide, to produce numerous combinations. Monograms are generally combinations of more than two letters; when only two were incorporated they were generally designated ligatures. After the twelfth century they gradually went out of use. The use of them remained longest in Germany, where it was formally abolished by the Diet of Worms, in 1495. The knowledge of monograms of this public kind is of great importance for the illustration of the monuments and documents of the middle ages, and therefore forms a particular branch of diplomatics; for they were much employed in the mediæval diplomatic art. The term was subsequently applied to all sorts of ciphers and signs, with which artists, particularly painters and engravers, were accustomed to designate their works. These have often been counterfeited. The mediæval seal-engraver, to economize as much as possible the annular space available for the legend, favoured much both ligatures and monograms. Many of those seals had the initials of their owners blended and incorporated with the devices, called *merchant-marks*, corresponding somewhat to our trade-marks, which were the stamp, as it were, by which the work of each artist was known. Many of the modern monograms are copied from mediæval examples. They are produced mostly upon paper and articles of plate. Many of them are beautiful, chaste, and of exquisite quaintness and intricacy. The ancients called every outline, every simple sketch, a monogram. Montfaucon, in his Paléographie Grecque, has given a very extensive catalogue of monograms taken from medals of various kinds. Johann Fr. Christ's collection of figures of monograms, accompanied by explanations, Anzeige und Auslegung der Monogrammatum (Leipzig, 1747), is valuable; also Brulliot's celebrated Dict. des Monogrammes, completed and corrected, in his Table générale des Monogr., Chiffres, &c. (Munich, 1832–34); Horne's Introduction to Bibliography, vol. ii.; and Herbert's and Ames's Typographical Antiquities.

MONOMANIA (from *monos* and *mania*), the name given by some physicians to that form of mania in which the mind of the patient is absorbed by one idea; for instance, if the patient believes that he is God, or Christ, an emperor, &c. See INSANITY.

MONONGAHELA, a river which rises from the Laurel Mountains, in Virginia, runs north into Pennsylvania, and unites with the Alleghany, at Pittsburg, to form the Ohio. It is navigable for large boats 60 miles, and for small boats 200 miles from its mouth. Its principal tributaries are the Cheat and Youghiogeny. Its length is about 300 miles.

MONOPHYSITES, the members of the party who, according to the language adopted in the fifth century, maintain that there is but one nature in Christ, that is, that the divine and human natures were so united as to form but one *nature*, yet without any change, confusion, or mixture of the two natures. They were condemned as heretics at the Council of Chalcedon in 451, which maintained that in Christ two distinct natures were united in one *person*, and that without any change, mixture, or confusion. This distinction without a difference gave rise to a violent dispute. The Asiatic and Egyptian clergy were inclined to the Monophysites, and were unanimous in maintaining the unity of nature as well as of person in Jesus, while the Western contended for the decree of the council. The edict called Henoticon, issued by the Emperor Zeno in 482, was not able to quiet the combatants, and, after long and often bloody contests, the orthodox church, by its sentences of excommunication, occasioned a formal secession on the part of the Monophysites. This separation took place in the first half of the sixth century, when the protection which the Monophysites had hitherto received at times from the court at Constantinople necessarily ceased from the close union of the Emperor Justinian with the Roman Church. Neither did they remain united among themselves. In 483 the Acephali had already seceded, and formed the real strength of

Monophysitism. In 519 new controversies arose among them respecting the question whether the body of Christ is corruptible or not. The Severians, adherents of a deposed Patriarch of Antioch, Severus, who belonged to the Acephali, answered in the affirmative; the Julianists, or Gajanites, adherents of the Bishops Julianus, or Gajanus, in the negative. The former were therefore called *Phthartolatrists* (*Corruptícolæ*, worshippers of the corrupt); the latter, *Aphthartodocetæ* (teachers of incorruptibility), or, as an incorruptible body could only be apparent, *Phantasiasts*, who again divided respecting the question whether the body of Christ was created, and formed the parties of *Aktistetoi* (Greek *ktizō*, to create), those who held it increate, and the *Ktistolatrists*, who believed it created. The Severians, also called, from one of their bishops, *Theodosians*, acquired the superiority, and pronounced excommunications against the *Agnoëtoi*, who also arose among them (so called because they denied the omniscience of Christ as a man). About 560 a Monophysite, Askusnages, and after him Philoponus, the greatest Christian philosopher of that century, conceived the idea of styling the three persons of the Deity three Gods. These Tritheists and their adherents, even in the eyes of the Monophysites, were the rankest heretics, and were the occasion of many Monophysites turning Catholics. In Egypt, Syria, and Mesopotamia the Monophysite congregations, however, remained the strongest, had patriarchs at Alexandria and Antioch, existing, without interruption, by the side of the imperial orthodox patriarchs; and after the Syrian, Jacob Baradæus, had, about 570, established their religious constitution, formed the independent churches of the Jacobites and Armenians, which separated from the Greeks as well as the Romans, and have for that reason been able to maintain themselves since the seventh century, even under the dominion of the Mohammedans. Excepting their peculiar doctrine of one nature in Christ, they coincide, in the main points of belief, with the Greek Church; their worship also resembles the Greek rather than the Roman, but has, from their national character and their superstition, received variations, which are most striking in the religious constitution of the Egyptian Jacobites. These Copts are in communion with the Syrian Jacobites, but have their own patriarch at Cairo, the Patriarch of Alexandria, who has ten bishoprics under him. The Bible and liturgical books they possess in the old Coptic language, but these are always accompanied by an Arabic translation. The Abyssinian Church is also Monophysite in doctrine. See JACOBITES and *Armenian Church* under ARMENIA.

MONOPOLI, a town and seaport of South Italy, in the province and 27 miles E.S.E. of Bari, on the Adriatic. It is seated on an eminence, walled, and defended by a castle built in 1552 by Charles V. It has two suburbs, consisting of well-built houses; but the town itself is indifferently built; the houses being too lofty for the width of the streets, these are dark and gloomy. It has a cathedral, and numerous other churches; two harbours, with great depth of water, but imperfectly sheltered; manufactures of woollen and cotton cloth; and a trade in wine and olives. The adjacent territory yields an immense quantity of olive-oil. Pop. (1881), 13,154.

MONOPOLY (Greek, *monopolia*, single or sole selling) is an exclusive right, secured to one or more persons, to carry on some branch of trade or manufacture, in contradistinction to a freedom of trade or manufacture enjoyed by all the world, or by all the subjects of a particular country. The most frequent monopolies formerly granted were the right of trading to certain foreign countries, the right of importing or exporting certain articles, and that of exercising particular arts or trades. Such exclusive rights were very common in Britain previous to the accession of the house of Stuart, and were carried to an oppressive and injurious extent during the reign of Queen Elizabeth. The grievance at length became so insupportable that, notwithstanding the opinion of government, which looked upon the power of granting monopolies as a very valuable part of the prerogative, they were abolished by an act of 1624, the 21 James I. cap. iii. This act secured the freedom of industry in Great Britain; and has done more, perhaps, to excite a spirit of invention and industry, and to accelerate the progress of wealth, than any other in the statute-book. A few monopolies, however, on a large scale still exist. There is one species of monopoly sanctioned by the laws of all countries that have made any advances in the arts, namely, the exclusive right of an invention or improvement for a limited number of years. It is, in fact, a kind of property created by law for the benefit of the inventor, and which he could not effectually acquire or secure without the aid of the law. The exclusive right of an author to the publication of his own work is hardly a monopoly, but rather a right of property, resting upon the same principle as the right to lands or chattels. The law, therefore, by giving an author the exclusive right to the publication of his own work for a limited number of years makes no grant; it is only allowing him what is his own for a limited time. But the exclusive right to the use of an invention or improvement is a monopoly, since it deprives others, for that period, of the chance of the advantage of making the same improvement, discovery, or invention themselves. It is taking away a right which they before had. The reason for this is the encouragement of inventions and improvements, in the policy of which all the world concurs. This is the only kind of monopoly generally acknowledged to be useful and expedient. The term monopoly occurs in Aristotle's Politics (i. 11), where it simply means a man's buying up the whole of a commodity, so that being the sole holder he may sell it at his own price. By the English law, if the granting of a monopoly raised the price, deteriorated the commodity, and impoverished artificers, the royal grant was void. The term monopoly, therefore, in this sense, has legally ceased to exist. There is still a vulgar though incorrect use of the term which it may be well to notice. Capitalists, either single or combined, may produce commodities so much better and cheaper than others can do as practically to command the entire sale, and are in popular language called monopolists. But having no legal rights or advantages that are not open to all, they are not in the legal sense in possession of a monopoly. In the oldest sense of the term they are monopolists; but since the term is now used in an unfavourable sense, its discontinuance as applicable to these is only just. It may be assumed as an economical axiom that every interference with absolute freedom in acts of exchange can be defended only on the highest grounds of public policy. Any advantage given to a particular interest is not only a wrong to the general public, but will in time bring a just retribution to the favoured class.

MONOPTERAL TEMPLES. See ARCHITECTURE.

MONOTHEISM (Greek, *monos*, and *theos*, God), the belief in, and worship of, a single God, opposed to a plurality of gods (polytheism). In attempting to ascertain the origin of this belief we must examine not only historical documents, but also the rise and growth of language. Professor Max Müller is of opinion that the conviction of the existence of one God was not an intuition, but the result of a gradual education. It is held by some that the third chapter

of Genesis embodies the doctrine of the unity of the Godhead, and of a co-equal and co-eternal Trinity; but granting this, how are we to account for the existence of a monotheistic religion in peoples having no ethnological connection with the Semitic race? In the earlier Vedic writings, which exhibit the most primitive workings of the human mind of which we have any record, we find that a consciousness of their own existence led men to endow every created object with life. The natural issue of such a condition of thought was either polytheism or fetishism, that is, either a plurality of deities with human forms and passions, or an abject terror of inanimate objects. But anthropomorphous polytheism did not determine the convictions of the highest thinkers under the system, such as Parmenides, Socrates, Plato, &c. The writings of Hesiod and Sophocles prove that the religious convictions of a people are not to be measured or tested by the gross details and elaborate observances of a mythological system. The Jewish prophets had a firm persuasion of one God, the Father and Judge of all; but they are continually upbraiding the people for lapsing into polytheism. After the Babylonish captivity the people became fixed in their belief; and now the Jews and Mohammedans hold the doctrine of the divine unity with greater rigour and tenacity than modern Christians. They not only will not countenance, but reject with the greatest vehemence, the Trinitarian conception of Deity.

MONOTHELITES (Greek, *monothelētai*, from *monos*, and *thelō*, I will), a sect of heretics who maintained that though Christ had two natures co-existing distinctly in the unity of the person, yet these natures possessed or acted by but a single will—the divine, which so predominated over or absorbed the human as to deprive it of all action or efficiency. They have been regarded as an offshoot of the Monophysites, though they themselves denied all connection with them. The doctrine is said to have originated with the Emperor Heraclius, who in 630, by adopting a middle course, attempted to reconcile the Monophysites to the orthodox church. The attempt was for a time successful. Heraclius consulted Sergius I., patriarch of Constantinople, on the new dogma, who not only approved of it, but became its most active propagandist. At his instance, and mainly in consequence of his representations, Pope Honorius I. for some time maintained a politic silence regarding the question, and then approved of it in two epistles addressed to Sergius. The successors of Honorius condemned the Monothelites, and Martin I., in 649, issued a bull consigning them and their patrons 'to the devil and his angels.' For this he was sent prisoner to the Chersonesus by the Emperor Constans, who protected the Monothelites. The sixth œcumenical council, that of Constantinople, held in 680, formally condemned this heresy, and with this the early controversies on the incarnation became gradually fainter, till they died out and were forgotten amid the disputes between the Iconoclasts and their opponents.

MONOTREMATA (Greek, *monos*, single; *trema*, opening), the lowest order of Mammalia, corresponding to the *Ornithodelphia* of De Blainville. It includes but two genera, *Ornithorhynchus* and *Echidna*. The former has but one species, the *Ornithorhynchus paradoxus*, or Duck-billed Water-mole of Australia; the latter genus includes two species, the *Echidna hystrix*, or Porcupine Ant-eater of Australia, and the *E. setosa* of the same province. (See Pl. CXIII.–CXIV.) The characters of the monotremes have reference firstly to the structure and disposition of the urinary and genital passages. The two oviducts enlarge each into a distinct uterine cavity or womb, which opens separately from its neighbour into a *cloaca* or chamber, which also receives the terminal ducts of the urinary organs and the rectum. This disposition of parts, forcibly reminding the anatomist of the conformation of the genitalia in birds, has suggested the name *Ornithodelphia* (Greek, *ornithos*, a bird; *delphus*, womb) applied to the division of Mammalia which includes this single representative order; whilst the name *Monotremata* applied to the order has also been suggested by this conformation of parts. The angle of the lower jaw in the Monotremata is not inflected, and teeth are entirely wanting in this order; the Ornithorhynchus alone possessing horny plates instead of true teeth. The skeleton presents several notable exceptions to that of all other mammals in several points. Thus the *coracoid bones*, which in other mammals exist as the simple *coracoid processes* of the *scapula* or 'shoulder-blade,' are distinct bones in the Monotremata; and these coracoid bones connect the sternum or breast-bone with the scapula. This is an essentially bird-like disposition of parts; and as in birds and reptiles, there is also present in Monotremata an *inter-clavicular* bone, which is T-shaped, and which gives support to the clavicles or collar-bones. This inter-clavicle may either be a largely developed portion of the inner end of the clavicle (*omo-sternum*); or it may be a specially developed bone, which is represented in birds and reptiles, but has no representative in any other mammals than those of the present group. The internal tendons of the external oblique muscles of the abdomen become ossified to form the so-called 'marsupial bones,' which, however, do not, as in the order Marsupialia, support a 'pouch.' The bones of the skull, as in birds, become firmly united together by bony union at an early period of life, the sutures or lines of union between the various cranial bones, which are generally more or less distinct in other mammals, being obliterated in the monotremes. The testes of the male animals are retained permanently within the abdominal cavity, and no scrotum thus exists. The efferent ducts of the male genitalia open into the cloaca in common with the other efferent ducts already mentioned. The mammary glands are destitute of nipples, the milk-ducts opening simply on the surface of the gland; or, as in *Echidna*, they may open in a depression or shallow sac during the period of milk-secretion (fig. 18, Pl. CXXI.–CXXII.). The mammary glands are two in number, and are abdominal in position. The glands are compressed at the will of the parent by a special muscle, the *panniculus carnosus*, and not by the fibres of the *cremaster* muscles, as in the kangaroos and other marsupials. External ears are completely wanting in both genera of this order. The brain exhibits marks of inferior structure to that of the generality of Mammalia. The cerebellum or lesser brain is completely uncovered by the cerebrum or true brain when viewed from above. A *corpus callosum* or transverse commissure connecting the halves of the cerebrum is alleged by Owen to be entirely wanting; whilst by Flower and Huxley the existence of this structure in a small and rudimentary condition is maintained. The development of the young has not been at all studied. No placenta exists; and the embryo may at birth be provided with a caruncle or process borne on the snout, as seen in birds and Reptilia. In both genera the feet are furnished with five toes, provided with claws. The male *Ornithorhynchi* possess spurs attached to the tarsi or posterior aspect of the hind feet, which spurs communicate internally with a gland. The nature of this apparatus was long thought to be that of an offensive or defensive organ; but it is doubtful if this supposition is correct. Both genera of Mono-

Monroe, James, fifth president of the United States, born in Westmoreland county, Virginia, April 28, 1758. He was educated at William and Mary college, and in 1776 left it to enter the army of the revolution. He was appointed a lieutenant in the 3d Virginia regiment, and in the battle of Harlem heights, Sept. 16, 1776, was severely wounded in the shoulder. In December he was promoted to a captaincy, and in February, 1777, to a major's commission. He was present at the battle of Brandywine, Sept. 11, 1777, and was again severely wounded. In October he was appointed lieutenant colonel of the 3d regiment, and in January, 1778, was transferred to the 1st regiment. He was present at the battle of Monmouth, June 28, 1778, and in December was appointed by Washington to the command of a detachment to be employed against the British in East Florida. Before the detachment was ready for service, however, he was appointed by Governor Jefferson a member of the executive council of Virginia, and he declined the command. He was elected to the council, and served in that capacity from January to May, 1779. In the latter year he was elected to the legislature, and was appointed by the joint ballot of both houses a member of the council of state, in which he served from June, 1779, to November, 1780. In the latter year he was appointed by Governor Jefferson a commissioner to the state of North Carolina, to confer with the commissioners of that state and of the United States concerning the operations of the war in the southern department. In 1781 he was elected to the legislature, being then but 23 years of age, and was immediately appointed by that body a delegate to the congress of the confederation, in which he served three years. He was present at the capture of Cornwallis at Yorktown, Oct. 19, 1781, and was one of the committee appointed by congress to receive the sword of the British general. In 1782 he was appointed by congress one of the commissioners to settle the accounts between the United States and the several states, which office he held for two years. In 1783 he was elected to the legislature, being then but 25

till 1814, when it was ultimately incorporated with Belgium. Pop. (1880), 24,049.

MONSEIGNEUR (French, my lord), a title of dignity in France. Before the revolution the dauphin was styled *monseigneur*, without any addition. Princes, dukes and peers, archbishops, bishops, cardinals, marshals of France, presidents of parliament, &c., were addressed by this title. The plural is *messeigneurs*. The Italian *monsignore* is used in a similar manner.

MONSIEUR (in French), used simply, without any addition, formerly designated the king's eldest brother. In common use it answers both to the English *Sir* and *Mr.*, and is also used before titles. In writing it is expressed by the abbreviation *M.* The plural is *messieurs*.

MONSOON, the name given to the trade-winds and counter-trades of the Indian Ocean. They are from the south-west from April to October, and in the opposite direction during the rest of the year. See METEOROLOGY.

MONSTER, or MONSTROSITY, a term used in anatomy and physiology to indicate living beings which exhibit some abnormal points in structure, or present deviations from the normal type of their kind, such abnormalities or deviations being present at birth. The department of science which undertakes the investigation of such abnormal forms is now known as that of *teratology* (Greek, *teras*, monster; *logos*, science), this name being first used by Geoffroy St. Hilaire. The science of teratology is by some regarded as forming a subdivision of *pathological* anatomy, whilst others consider it as included within the limits of ordinary and normal anatomical science. The latter authorities maintain that a knowledge of the perfect and normal structure of any organism is necessary and requisite before we may satisfactorily unravel the complexities and malformations into which disease, or abnormal processes of growth, may lead the living embryo. But the wider and more correct view would be to argue for the science of teratology a separate and distinct position, since the study of abnormalities and malformations demands an acquaintance with not only the structure but also with the physiology and functions of the organism; and with the processes of generation, reproduction, and development through which it has passed.

Monsters present very wide variations in the characters and degrees of the malformations in virtue of which their peculiarities exist. And these variations lead us from an almost imperceptible perversion of a normal process of growth, through gradations, to a condition of matters where almost every normal phase of structure and function appears set aside, and where the being may scarcely be recognized as belonging to its normal type. The *causes* or more obvious conditions which tend to produce malformations in living forms may, in the first place, be briefly glanced at; and the classification of abnormalities may occupy attention in the second instance. The present is a subject which prurient curiosity, superstition, and ignorance, have together made peculiarly their own in a popular sense. Tales of deformed monsters occurring both in man and in beasts may be met with in the writings of the older anatomists and naturalists; but it is almost needless to remark that such accounts, if not entirely destitute of truth, owe most of their interest to the liberal embellishment with which they have been recorded by these earlier writers. Tales, for example, of beings, born of women, which possessed bodies half human and half brute-like, are abundantly met with; and we thus find Rueff in 1580, and Caspar Schottus, gravely debating the question whether such beings could or could not be produced by the sexual union of women with devils—a query, it may be added, which they answered in the negative. Similar or contemporaneous writers have argued for the production of such ideal monsters by the sexual union of brutes and men; and witchcraft, magic, spells, divine vengeance—and, more lately, the effect upon the mother's mind of fright, terror, dreams, &c.—have each and all been credited with causing malformations and abnormalities in the yet unborn child or embryo. Indeed, the belief in the last-mentioned cause is as powerful and as widely-diffused in the present day as ever it has been. Instances are given by the uneducated and illiterate, and even by the otherwise well-informed, of cases where a pregnant woman, having seen a criminal broken upon the wheel, gave birth to a fœtus the bones of which present a similarly crushed or analogous appearance to those of the criminal. Another parturient woman sees the stump of an arm after amputation, and her child is born without a hand. Another holds a frog in her hand, and afterwards bears a child with a face and head like that of a frog. Longings or desires in the mother are alleged to have effect on the child; and instances in illustration of this belief might be multiplied *ad infinitum*. Admitting the physiological influence of the mother over her offspring as a perfectly natural result—evidenced, for example, by the transmission of disease, &c.—the foregoing belief and examples are at once seen to be absurd and unworthy of credence. The *post hoc*, as has been remarked, cannot always, and specially in these cases, lead definitely to the conclusion *ergo propter hoc*. The vivid imagination of neighbours and friends generally first starts the supposition of malformation, and of its likeness to some object; and having first found the result, it is an easy thing in such cases to produce a cause. Then also we must consider how ineffectually these explanations or suppositions account for malformations which occur *without* any previous alarm or injury having happened to the mother; and also that the *a priori* fears of the mother are seldom or never borne out by the subsequent appearances of the child. Why in one case fear or injury should operate, and not in the vast majority of others, is a point of which these explanations and beliefs can take no heed. Even in cases where a malformed child has been born, and where the mother during a second pregnancy has been tormented by fears for the healthy structure of her next child, it most commonly happens that notwithstanding her fears this second and subsequent children are born in a perfectly normal state. In the latter case the influence of the mother, according to the popular belief, should be even more powerful than in a single or first case. To these considerations may be added, in refutation of such beliefs, the facts that the relations of the fœtus and the mother, however intimate, are not of such a kind that they may be influenced by purely mental emotions or fancies; and when we consider that malformations occur in the lower animals (for example, insects, molluscs, &c.), in which no mental emotions can be supposed to exist, the argument for these beliefs must lose much or all of its apparent worth and stability. Twins may be born, of whom one may be deformed and the other perfectly healthy, and it is difficult to conceive how one should escape in such a case, when both are exposed to the same influences; whilst lastly it may be urged that malformations of deep-seated organs (such as the liver, bladder, intestines, &c.) exist, concerning the nature or presence of which organs the mother may be, and generally is, completely ignorant. The transmission of *disease* (such as scrofula, syphilis, scarlet-fever, small-pox, jaundice) from the mother to the child is a very different process, and is effected through the maternal blood and tissues by contact, and in ways explicable on pathological and physiological grounds.

[illegible] of the [illegible] types of generative organs, the latter [illegible] and hence the anatomist may at [illegible] all doubtful cases of monstrosities by [illegible] that they present characters perfectly in accordance with any known type of abnormal development.

The classification of malformations, regarded from the foetus itself, includes as its first division those cases in which the *[illegible] or other structures are [illegible] rudimentary or atrophied, or wholly [illegible] wanting.* In this division are included cases of *Acephali*, or Headless Fœtuses, this type including several variations in the degree or extent of the malformation. Similarly *Asomata*, or Bodiless forms are classed in this section. Other forms want the trunk of the body, or else both limbs; or even, as in other cases known, the hands and feet may be attached to the trunk directly, and without any intermediate arms or legs. Fingers and toes may be wanting or rudimentary. The contents of the chest or abdomen—lungs, heart, intestines, &c.—may be exposed (*ectopia*) through a non-development or non-closure of the front wall of these cavities; and certain viscera or organs themselves for example, the lower jaw) may be wanting or may exist in a rudimentary condition, whilst the eyes, nose, and other organs of sense may similarly be undeveloped. The fœtus itself in the earlier stages of its existence may undergo a general process of *atrophy* or wasting, which may arise spontaneously or from diseased surroundings—the result of this latter process being to annihilate *in toto* the conditions of fœtal existence, and to produce a malformation of all its parts and structures.

The second type of malformations consists in the *presence of union between normally free and unconnected parts and structures.* Thus of themselves the bodies of two distinct and separate embryos may be united in various ways, union thus taking place in the totality of the fœtus, as it were. And similarly individual portions of the frame—such as the eyes, nostrils, mouth, genital openings, &c.—may be closed or united in such a manner as to produce serious malformation.

A third type of monstrosity may be observed to include forms in which *parts normally united are left free and unconnected*, this variety being the opposite of the preceding cases. Such instances have already been referred to under the first type—as cases where, from want of development, the walls of the abdomen or chest have been deficient or have not united, and where *ectopia*, or eversion of the contained viscera, takes place. Other examples of this variety are seen in cases of cleft palate, hare-lip, fissures of the neck corresponding to the branchial clefts or openings of early vertebrate life, *spina bifida*, or cleft spine, &c.

The fourth section is represented by *forms which exhibit evidence of excessive development of parts or structures.* Thus attached to the fœtus portions of the body of a second fœtus may occasionally be found, but in such cases arrest of development in the latter may more naturally explain the presence of the abnormality than excess of development in the former. Supernumerary fingers, toes, and limbs, fall under the category of true excesses in development. And in the case of true *double monsters*, the excess is carried to its most typical limits. The duplicity in structure may be *anterior*, where two bodies are placed face to face, and are united by their chests and abdominal cavities, in whole or in part, whilst the head and extremities of each are free. In *lateral* duplicity, so-called, the union is still anterior, but the bodies are capable of being separated laterally to a greater or less extent. *Inferior duplicity* consists in union

of the bodies by their lower parts, as by the buttocks —a head existing at either end of the compound body. *Posterior duplicity* indicates union by the backs or pelvis. *Superior duplicity* is represented by the cohesion of the skulls or heads. Of *triple* monsters only one or two well-attested examples are known. The degree of union between some forms may be of comparatively slight kind so far as mere connection is concerned, but in such cases the presence of vital parts and organs in relation to the connecting part may of itself render the union a complex one. In the case of the famous Siamese twins, the autopsy showed the presence, in the connecting band, of structures belonging to the abdominal viscera and peritoneum, the division of which would have caused death; and yet the degree of connection in their case was of comparatively simple kind, being limited to the fleshy band. In the 'Two-headed Nightingale' or 'African Twins,' the union is of a more intimate kind, coalescence of the two bodies taking place by the pelvis and lower parts of the trunk; as was also the case in the 'Hungarian Sisters,' who lived till their twenty-second year.

A fifth section, sometimes merged in the preceding division, includes *abnormalities in the position of organs*. Exemplified by cases in which the viscera (for example, heart, liver, &c.) may occupy abnormal situations, or by cases in which an additional head may be developed in an anomalous position.

The last group is represented by *malformations and abnormalities of the genital and reproductive organs*, these deviations being of so important a type that their full consideration occupies a separate and distinct section. Under this latter division are grouped not only cases of malformations where the sex is perfectly distinct and determinable, but instances in which the sexes become united, and the genitalia coalesce to a greater or less extent. The latter constitute the *hermaphrodites* of teratology and popular language. All malformations of the genitalia may in one sense be included under the term *hermaphroditism*, and in this view the hermaphroditism may be entitled *spurious* or *true*, accordingly as one sex only is involved, or as two sexes participate in the production of the abnormality. Thus spurious hermaphroditism is represented in the male by cases of extroversion of the bladder; by the non-union of the halves of the penis which are normally separated in early life (*hypospadias*); by the adhesion of the penis to the scrotum; or by the non-descent of the testicles into the scrotum, added to other abnormalities. In the female, excessive development of the clitoris; prolapse or falling-down of the womb, &c., produce appearances similar to, and which may be mistaken for, those of hermaphrodite malformation. In *true* hermaphroditism we may find the ovary proper to the female present on one side only, and the testicle of the male present in place of the corresponding ovary of the other side. Or again the *external* genital organs may be of the male type, and the *internal* organs of the female type, or *vice versâ*. And in *double* hermaphroditism we may find ovaries associated with a rudimentary uterus, with the seminal vesicles of the male, and with rudiments of the male *vasa deferentia*. Conversely, the male organs may be in the ascendant, and added to these we may find a rudimentary uterus and its appendages. And lastly we may find true testicles and ovaries coexistent on one or on both sides of the body. Instances are also well known where the mammary glands (which see, as also MILK) of the male have assumed the functions and size of those of the female; and four mammæ have been represented in the human subject.

Malformations and monstrosities are frequently met with in the lower animals, and particularly in those which are domesticated by man. In the plant world monstrosities also occur—abnormality in development being thus co-existent with sex and sexual reproduction. But as yet we are very far from the determination of the *intimate causes* of these malformations, or indeed of the operating principles of sex themselves, in virtue of which the whole act of sexual reproduction assumes its intricate and complex characters.

MONSTRANCE (Latin, *monstrare*, to show), otherwise REMONSTRANCE, called also *ostensorium* or *expositorium*, from its being the sacred vessel on which, in the Roman Catholic Church, the consecrated wafer or host is shown to the people at benedictions, processions, and other solemnities. Its use probably dates from the establishment of the festival of Corpus Christi in 1264 by Pope Urban IV., though it is known to have been carried in procession as early as the eleventh century. It is not, however, till 1452, the date of the Council of Cologne, that we have any testimony that the host was exhibited visibly to the people, having been previously deposited in an opaque receptacle called the *ciborium* (from *cibus*, food, in reference to its contents). Originally the monstrance resembled an ordinary reliquary; but subsequently it assumed various shapes, gradually becoming more highly ornamented. The most common form now in use consists of two parts, a chalice-footed stand of some precious metal, and the repository in which the host rests, which is usually a transparent pyx, surrounded by sun-like rays.

MONTAGNARDS, and sometimes LA MONTAGNE, 'the Mountain,' a popular name in French history, applied in 1793 to the extreme democratic party in the Convention, because they occupied the higher rows of benches in the hall where it met. The chiefs of 'the Mountain' were Danton, Marat, Robespierre, St. Just, and Collot d'Herbois, the men who introduced the 'Reign of Terror.' Their opponents, the Girondists and the moderate men generally, seated themselves on the lower benches in the centre of the house, and were thence called 'the Plain' (la Plaine). As the power of the more violent politicians increased the term 'Mountain' became in the course of time a title of honour, which on the fall of Robespierre was changed into one of reproach. In the height of its power the Mountain was master of the popular societies, of the authorities and people of Paris, and sufficiently formidable to stifle all opposition. Soon after the fall of Robespierre the denominations of 'Montagnard' and 'Montagne' gradually disappeared from party nomenclature. An attempt was made by the extreme party in the National Assembly, after the revolution of 1848, to revive the title of 'Mountain,' but it was a pure anachronism. Circumstances had entirely altered, the manners of the nation were completely changed, and the genius of the terrible chiefs of the first Mountain was nowhere to be found among the members of the second.

MONTAGU, LADY MARY WORTLEY, one of the most celebrated among the female literary characters of England, was the eldest daughter of Evelyn, duke of Kingston, by his wife Lady Mary Fielding, the daughter of the Earl of Denbigh. She was born about 1690, at Thoresby, in Nottinghamshire, and displaying uncommon abilities at an early age, was educated upon a liberal plan, and instructed by the same masters as her brother in the Greek, Latin, and French languages. In her twentieth year she gave an extraordinary proof of her erudition by a translation of the Enchiridion of Epictetus, which was revised by Bishop Burnet, by whom her education was

ultimately superintended. Her mind was nourished in great comparative retirement previously to her marriage, in 1712, with Edward Wortley Montagu. Even after her marriage she lived chiefly at her husband's seat of Wharncliffe, near Sheffield, until the latter, being introduced to a seat in the treasury by the Earl of Halifax, brought his wife to London. Being thus placed in the sphere of the court she attracted that admiration which beauty and elegance, joined to wit and the charms of conversation, never fail to inspire. She became familiarly acquainted with Addison, Congreve, Pope, and other distinguished writers. In 1716, Mr. Montagu being appointed ambassador to the Porte, Lady Mary determined to accompany him, and hence her admirable correspondence, chiefly consisting of letters addressed to the Countess of Mar, Lady Rich, and Pope, to whom she communicated her observations on the new and interesting scenes to which she was a witness. On many occasions she displayed a mind superior to common prejudices, but in none so happily as in a courageous adoption of the Turkish practice of inoculation for the small-pox in the case of her own son, and a zealous patronage of its introduction into England. In 1718 Mr. Montagu returned to England, and at the request of Pope Lady Mary took up her summer residence at Twickenham, and a friendship was formed between the two which gradually gave way to dislike, produced by difference of political opinion, petulance and irritability on the side of the poet, and no small disposition to sarcastic keenness on that of the lady; and a literary war ensued which did honour to neither party. Lady Mary preserved her ascendency in the world of rank and fashion until 1739, when, her health declining, she took the resolution of passing the remainder of her days on the Continent, not without the world surmising that other causes concurred to induce her to form this resolution. She, however, retired with the full concurrence of her husband, with whom her subsequent correspondence betrays neither resentment nor humiliation. Residing first at Louvère, then at Venice, she remained abroad until the death of Mr. Montagu in 1761, when she complied with the solicitations of her daughter, the Countess of Bute, and returned to England after an absence of twenty-two years. She enjoyed a renewal of family intercourse for a short time only, as she died of a gradual decay, 21st August, 1762, aged seventy-two. As a poetess Lady Mary Wortley Montagu exhibits ease and some powers of description; but she is negligent and incorrect, and wants poetic inspiration. The principal of her performances in this class is her Town Eclogues, a satirical parody of the common pastoral, applied to fashionable life and manners. As a letter-writer her fame stands very high, being not inferior in England to that of Madame de Sevigné in France. Her letters were collected and copied by herself, and presented in 1766 to the Rev. Mr. Sowden of Amsterdam, of whom they were purchased by the Earl of Bute; a surreptitious copy of them was published in 1763 in three vols. 12mo. The authenticity of these letters, which obtained universal admiration for their wit, judgment, and descriptive powers, was for a long time doubted; but all distrust was done away by the following publication, under the sanction of the Earl of Bute—the Works of the Right Honourable Lady Mary Wortley Montagu, including her Correspondence, Poems, and Essays, published by permission from her genuine papers (London, 1803, six vols. 12mo), with a Life by Mr. Dallaway. This edition contains many additional letters, written in the latter part of her life. A new edition of her letters and works, edited by her great-grandson Lord Wharncliffe, was published at London in 1837 in three volumes 8vo; and a second edition also appeared the same year. A later edition (2 vols. 8vo), by Moy Thomas, is still more correct and complete.

MONTAGUE, CHARLES, Earl of Halifax. See HALIFAX.

MONTAIGNE, MICHEL EYQUEM DE, one of the most ingenious and ingenuous of French writers, was born February 28, 1533, at the castle of the same name, belonging to his family, in Périgord. His father, who was of English descent, bestowed the greatest care on the cultivation of young Michel's promising talents, but adopted a peculiar mode of education. In order to facilitate his son's acquisition of the Latin language he employed a German tutor, entirely ignorant of French, but complete master of Latin, before the child had left the nurse's arms, and he had the pleasure of seeing the infant so completely matriculated into it as to be obliged to learn the French as a foreign tongue. Greek he learned in the usual manner after it had been attempted in vain to delude him into a knowledge of it. The treatment of his father was peculiar in some other respects: thus he allowed him the most unrestrained indulgence in his sports, and endeavoured to lead him to the faithful performance of his duties solely by inspiring him with a sense of right and wrong. Montaigne always shows the greatest regard for his father's memory. At the age of thirteen he had finished his studies at the College of Bordeaux, under Grouchi, Buchanan, and Muret. His father destined him for a judicial station, and Montaigne was for some time a parliamentary councillor, but his aversion to the duties of the station led him to retire from it. The study of man was his favourite occupation. To extend his observations and to restore his health, which had been shattered by the attacks of a hereditary disease, he travelled in Germany, Switzerland, and Italy, and was everywhere received with great distinction. At Rome, which he visited in 1581, he received the title of a Roman citizen. In 1582 he was chosen mayor of Bordeaux, and the citizens of that place were so well satisfied with his administration that they sent him to the court (in 1584) to attend to their interests there. After making several other journeys of business he returned to his castle, and devoted himself entirely to philosophy. His quiet, however, was disturbed by the troubles which distracted France in consequence of the cruel persecutions of the Huguenots; his castle was plundered by the Leaguers, and he himself was ill treated by their adversaries. To these causes of distress was added the plague, which broke out in Guyenne in 1585, and compelled him to leave his estate, with his family, and wander through the country, which was then the theatre of all kinds of atrocities. He then resided some time in Paris, but finally returned home, and died 13th September, 1592, after much bodily suffering, with the composure of a philosopher.

Montaigne has described himself in his celebrated Essais. He had few of what are commonly called friends, but he loved to converse on familiar terms with educated men, and he was also fond of the society of handsome and intelligent women. He had many ideas on education which have been revived in our times without his receiving the credit of them. His views on legislation and the administration of justice enlightened his own age and have been useful to ours. His moral system was in general indulgent, but on some points strict. Speculative philosophy he rejected devoting himself to the lessons of experience. Equally removed from a general scepticism and from dogmatism he was accustomed to suggest possibilities instead of making assertions, and to throw light on his subject from every point. His motto was *Que*

sais-je? His great work, his Essais (first published in 1580, and often republished, and translated into many languages), contains a treasure of wisdom. It may still be deemed one of the most popular books in the French language. The essays embrace a great variety of topics, which are touched upon in a lively entertaining manner, with all the raciness of strong native good sense, careless of system or regularity. Sentences and anecdotes from the ancients are interspersed at random with his own remarks and opinions, and with stories of himself in a pleasant strain of egotism, and with an occasional license, to which severer casuists can with some difficulty reconcile themselves. The best editions are those of Coste (three vols. 4to, London, Tonson, 1724) and of Le Clerc (Paris, 1826–28, five vols. 8vo). His style, though not always pure and correct, accurate and elevated, is original, simple, lively, bold, and vigorous. Besides his Essais, his Voyages, the MS. of which was discovered at Montaigne nearly 200 years after his death, deserve mention, although not intended for publication. Montaigne also translated at the request of his father a treatise on natural theology by Raymond Sebonde. There are two English translations of the Essais, one by Charles Cotton, and an earlier one by John Florio. Several biographies of Montaigne have been published, of which may be mentioned those of Bayle St. John (London, 1858, two vols. 8vo) and of F. Bigorie de Laschamps (second edition, Paris, 1860, 12mo).

MONTALEMBERT, CHARLES FORBES, COMTE DE, a French publicist, politician, historian, and theologian, was born in London in April, 1810, and died at Paris, 12th March, 1870. His father was of an ancient family of Poitou, and had been created a peer of France under the Restoration, while his mother was a member of the Scottish family of Forbes, which accounts for his familiarity with the English language, and his strong sympathies for the social and political systems of England. He cherished strong contradictory ideas, as a love for liberty, aristocracy, and ultramontanism. When a student at Henri Quatre's College he had formed a firm friendship with Lacordaire, which coloured the whole texture of his future life. Both, with some other distinguished youths, grouped themselves round the Abbé Lamennais, who had begun to promulgate his peculiar notions of a democratic theocracy, and of an alliance between liberty and Catholicism. L'Avenir, the organ of the body, appeared on the 17th of April, 1830, having assumed as its motto *God and Liberty*. In April, 1831, Lacordaire and Montalembert opened a public school without asking authority from the government. This subjected them to a judicial prosecution, but the defence of Montalembert before the Chamber of Peers was so brilliant and able that he and his friends were simply fined in 100 francs. Pope Gregory XVI., in an encyclical letter of 15th August, 1832, condemned the new organ, and Montalembert, still an uncompromising advocate of liberty, confined himself thenceforward to ultramontanism pure and simple. In 1836 he published his life of Saint Elizabeth of Hungary, having the year before taken his seat in the Chamber of Peers. Entertaining a profound aversion for the university, it was henceforth the object of his unremitting attacks as a senator, though he was equally strenuous as an advocate of the liberty of the press. His great oratorical successes date from 1844, and he was now the recognized defender and guide of the French episcopate. He had visited Madeira in 1843 to secure for his young wife the benefit of the climate, and at his leisure devoted himself to a history of Saint Bernard. With the exception of the ultramontanes of l'Univers, with whom he carried on some lively disputes, Montalembert was now accepted as one of the chiefs of the *Catholic party*, a phrase which he did much to make popular. He was eloquent in his advocacy of the liberation of Poland, and also lifted up his voice in favour of the Greeks, of the Syrian Christians, and of Ireland. After the revolution of February he became one of the leaders of the party of reaction, his object being to secure the domination of the clerical party, and the constitution of a strong aristocracy, like that of the middle ages, which he deemed the golden period of liberty. Though an enthusiastic member of the monarchical coalition of the assembly, assailing at once the republic and the president, he several times undertook the defence of Louis Napoleon, whom he characterized as the victim of one of the blindest and least justifiable ingratitudes of the times. Failing to be elected in 1857 he lived thereafter in retirement, occupied with his labours as a publicist and historian. He had been admitted into the French Academy in 1852, on which occasion he incurred from M. Guizot a stern reproof for the unrestricted expression of his clerical and aristocratic enmities against the revolution. The last period of his life, extending from 1857 to 1870, was mainly occupied in producing articles for Le Correspondant, in which, as the chief of the liberal Catholics, he attacked M. Veuillot, whom he accused of leading the church to its destruction. In 1869 he united himself to the adversaries of Papal infallibility, and congratulated his co-religionists of Coblenz for the firm attitude they had assumed against the recognition of the supremacy. A remarkable letter, written on the 28th of February, 1870, twelve days before his death, produced a great sensation in the Catholic world, from its containing the expressions that his countrymen had come at last *to sacrifice justice and truth, reason and history, as a holocaust to the idol which they have erected at the Vatican*. A list of his numerous writings would occupy much space. A complete edition of his works has been published in nine vols. (Paris, 1861–1868). Of almost no public man have so many contradictory estimates been written, the result of the very strong opinions he held on questions that agitated strongly the religious and political worlds.

MONTANA, a territory of the United States of North America, organized in May, 1864, out of portions of the territories of Idaho and Dakota. Except a small projection in the south-west it lies between 45° and 49° N. lat., and between 104° and 116° W. lon. Its length from east to west is about 560 miles, and its breadth about 275 miles. It is bounded on the north by the British possessions, on the east by Dakota, on the south by Dakota and a part of Idaho, and on the west by a prolongation of Idaho. Area, about 146,080 square miles. Pop. in 1880, 39,159. The surface is generally mountainous, the great range of the Rocky Mountains extending across the territory, while minor chains occur in different parts. The principal rivers are the Missouri, the Yellowstone, and Clark's Fork of the Columbia. The mineral wealth of the territory is very great, gold having been found in several districts, rich silver mines existing in more than one locality, and iron and coal having also been discovered. The animals are the bison or buffalo, the grisly bear, the Rocky Mountain sheep, and the antelope. The pine, fir, and cedar abound, and the country bordering on the Missouri is a gently undulating prairie, beautifully diversified with clumps of timber. The region, which not many years ago contained few inhabitants save savages, is rapidly progressing in wealth and population. The capital is Virginia City.

MONTANUS, born about the middle of the second century, in Phrygia, an illiterate man, who, according

to some of the ancient writers, gave himself out for the promised Comforter, who was to bring to perfect maturity the Christian system. This is probably an exaggeration. In his doctrines he deviates from the received opinions mainly in maintaining that all true Christians receive the inspirations of the Holy Ghost. The chiliastic or millennarian notions, and his rigid adherence to the letter of the law, he had in common with the judaizing Christians; and the moral peculiarities of his sect consisted merely in a more strict observance of externals, frequent fasts, the contempt of heathen learning and worldly conveniences, abstinence from second marriage, and a willingness to submit to celibacy and martyrdom. Priscilla and Maximilla, two prophetesses, assisted Montanus in his work. Eleutherus, bishop of Rome, issued a decree for the expulsion of him and his followers from the Catholic Church; the Montanists then organized themselves as a distinct sect. His disciples called themselves *Pneumatii*, from a belief in their superior spiritual perfection; they were also called *Pepuzians* and *Phrygians*, because their doctrines principally prevailed in Phrygia and Asia Minor in general. Tertullian, who himself became a Montanist about 200 A.D., defends their monastic rigour. On the other hand, the Alexandrian school, which was inclined to the Gnostic dogmas, opposed their fanaticism till they became extinct, in the fourth century, with the exception of some remains which survived a short time in Gaul, where the sect had been introduced by Phrygian colonists. Some of his followers appear to have embraced the Sabellian heresy, and the tendency of the sect was to form an arrogant religious aristocracy. A modern school of theologians seems to regard Montanism as a protest and reaction against Paulinism.

MONTARGIS (Latin, *Mons Argi*), a town of France, department of Loiret, on the Loing, at the junction of the Loing and Briare canals, 39 miles E.N.E. of the city of Orleans. It stands near an extensive forest of the same name, and is tolerably well built; has manufactures of cloth, leather, and paper; and a trade in corn, saffron, wax, honey, wool, and cattle. Pop. 11,164.

MONTAUBAN (Latin, *Mons Albanus*), a city of France, capital of the department of the Tarn and Garonne, on the Tarn, 342 miles south by west of Paris. It is finely situated on a plateau surrounded by the Tarn, the Tescou, and a deep ravine, and is well built. The cathedral, the episcopal palace, the hôtel de ville, and the bridge over the Tarn, are particularly worthy of being seen. Montauban has manufactures of silk bolting cloths, of common cloths, colours, porcelain, starch, candles, &c.; silk and wool spinning-mills, dye-works, potteries, &c. During the religious wars in France, Montauban was a stronghold of the Huguenots, and was besieged in 1580 by Montluc, and in 1621 by the troops of Louis XIII., without success; but it was taken in 1629 by Richelieu, and its walls razed to the ground. The Protestants still maintain both an academy and a theological college. Pop. 28,335.

MONTBELIARD (German, *Mümpelgard*), a walled town of France, in the department of Doubs, 40 miles north-east of Besançon. It is generally well and regularly built, has a court of first resort, a communal college, and a public library; hôtel de ville, public markets, several churches, a hospital, ancient college, &c.; manufactures of clocks and watches, hosiery, various tissues, agricultural implements, files, scythes, &c.; a cotton-mill, and numerous tanneries. Montbeliard is the centre of an important trade with Switzerland, and has also a good deal of general trade in agricultural produce and timber. G. Cuvier was born here. Pop. 8784.

MONT BLANC (White Mountain), the loftiest mountain of Europe, belonging to the Pennine chain of the Alps, and rising 15,781 feet above the sea level, is situated on the frontiers of France and Italy, and near that of Switzerland. The main portion of the mountain and the highest summit are in France (Haute Savoie). It forms a huge mass stretching north-east and south-west, in which direction the boundary line between France and Italy runs along it. Its north-eastern extremity enters Switzerland. In this latitude the snow line is 8000 feet, and consequently 7700 feet of the mountain are within the region of perpetual snow and ice. Its shape, when seen on the north or south, is pyramidal. On the south-east it presents an immense wall-face, on which, of course, few glaciers can be formed. These, of which eighteen in all are counted, are chiefly on the north-west slope, where the glaciers Des Bossons, Bois, Talèfre, and Mer de Glace are seen. The mass of the mountain consists almost entirely of granite. In 1760 Saussure offered a prize for the discovery of a practicable passage to the summit, which was reached by Jacques Balmat, a guide, June, 1786. It was next reached by Paccard, 8th August, 1786, but the ascent has since been made so often, and with so few accidents, that it is perhaps less hazardous than has been commonly supposed, though much is unquestionably due to the precautions used by government to ascertain the sufficiency of the guides, and regulate the mode of ascent. The desire to accomplish its ascent was very much increased by the publication, pictorial and dramatic, by Albert Smith, of a description of his ascent in 1851.

MONT CENIS. See CENIS.

MONT DE MARSAN (Latin, *Mons Martiani*), a town of France, capital of the department of Landes, at the junction of the Douze and Midou, which here form the navigable Midouze, and are spanned by handsome bridges, 62 miles south of Bordeaux. The streets are, in general, clean and regular, and adorned with numerous public fountains. It has a church, prefecture, court-house, prison, hospital, and barracks; a court of first resort, a society of agriculture, commerce, and arts, and a communal college. The principal trade consists in forwarding the wines and brandies of Armagnac to Bayonne. It has manufactures of common woollens, blankets, sail-cloth, and leather. Pop. 10,878.

MONT-DE-PIÉTÉ (in Italian *Monte di Pietà*), a bank of charity which lends money on pledges at a low rate of interest, and whose aim is purely philanthropic. The chief customers of such institutions, which are found in France, Italy, Germany, and other continental countries, are workmen pressed by a temporary failure of employment; small tradesmen without a bank account; or travellers in a large town whom some accident has subjected to a momentary strait; to all of whom it is a matter of necessity to conceal any compromise of their position in procuring money for present necessities. These institutions were established to prevent the scandal and abuse of usury. They date their origin from the middle ages, when the loan of money on pledges was almost exclusively in the hands of the Jews. They originated in Italy about 1450, and not long after were approved by several papal bulls. Several French and Italian cities possessed monts-de-piété in the latter half of the fifteenth century, among others, Mantua, Parma, Milan, Rome, Padua, Trèves, Boulogne, &c. The French monts-de-piété, with the exception of those of Montpellier, Toulouse, Grenoble, and Angers, which lend without interest, exact interest at the rate of from 4 to 12 per cent. The chief mont-de-piété in France is that of Paris, which transacts a greater amount of business

than all the rest together. It is said to receive in pledge as many as 1000 to 1200 watches a day. In Great Britain pawnbrokers take the place of monts-de-piété, which were introduced in the beginning of the eighteenth century, but failed. The Loan Fund Board of Ireland, established by 6 and 7 Vict. cap. xci. (1843), was modelled on the plan of these institutions.

MONTEBELLO, a village, Italy, Piedmont, 25 miles E.N.E. from Alessandria, on the left bank of the Copa, with a church, and a trade in silk and fruit, particularly nuts, apples, and pears. Here was an engagement, 9th June, 1800, between the Austrians and French under Lannes; and the French being victorious, Lannes was created Duke of Montebello. It was here also that, on 20th May, 1859, the first engagement took place between the allied troops of France and Sardinia under General Forey, and the Austrian forces, in which the latter were defeated. Pop. 1717.

MONTE CASINO. See CASINO.

MONTE CRISTO, the ancient *Oglasa*, a small island in the Mediterranean belonging to the Kingdom of Italy, and lying to the south of the island of Elba. In the sixteenth century it was ravaged by pirates, and as the soil is rocky and barren it has since remained uninhabited. There is a church, and the remains of an abbey and fort. Alexander Dumas has given the name of this isle to the hero of one of his most popular romances.

MONTECUCULI, or, more correctly, MONTECUCOLI, PRINCE RAYMOND, one of the greatest military commanders of modern times, born near Modena in 1608, bore arms at first in the capacity of a common soldier under his uncle, Count Montecucoli, in 1627, and rose successively through all the ranks. His first brilliant exploit was in 1639, when by a forced march at the head of 2000 horse he surprised a body of 10,000 Swedes, and captured all their artillery and baggage. Baner, however, hastened to attack the victor, and made him prisoner. Montecucoli now passed two years of captivity in the assiduous study of the military art. In 1646 he gained a victory over General Wrangel at Triebel. After the Peace of Westphalia (1648) he visited Sweden, and then returned to Modena, where, at a *carrousel* in honour of the marriage of the duke, he had the misfortune to kill his friend, the Count Manzani. In 1657 the Emperor of Germany sent him to the aid of John Casimir, King of Poland, against Ragotsky and the Swedes. Montecucoli defeated the Transylvanians, and drove the Swedish forces from Cracow. Charles Gustavus, King of Sweden, then attacked Denmark, but Montecucoli hastened to its defence, and relieved Copenhagen by land before the Dutch could introduce reinforcements by sea. The peace which followed this success did not leave him long in retirement: the conqueror of Ragotsky was now employed to protect that prince against the Turks. He compelled them to withdraw from Transylvania, and by a wise system of delay baffled all the attempts of their formidable force, until the arrival of the French, by whose aid he gained the great victory of St. Gothard, on the banks of the Raab (1664). This victory led to a peace, and Montecucoli was made president of the imperial military council. On the breaking out of the war between the empire and France he was placed at the head of the imperial troops, and checked the progress of Louis XIV. by the capture of Bonn, and by forming a junction with the Prince of Orange in spite of Turenne and Condé. The next year the chief command was taken from him, but was restored in 1675 that he might make head against Turenne on the Rhine. Montecucoli was the only adversary worthy of that great commander. They spent four months in following and observing each other, each conjecturing the movements of his opponent by what would be his own in the same circumstances, and they were never deceived. They were on the point of risking a battle when the French general was killed by a cannon-ball. (See TURENNE.) In the letter of Montecucoli to the emperor, in which he speaks of the death of his great rival, he says that he cannot help regretting the loss of a man who was an honour to human nature: these words he had repeated several times on hearing the news of Turenne's death. The Prince of Condé could alone dispute the superiority which that event gave him. The prince was at first worsted, but finally succeeded in making head against the imperial commander, who considered this campaign as the most glorious of his life—not because he conquered, but because he was not conquered. Montecucoli passed the remainder of his life at the imperial court, the patron of learning, and promoted the establishment of an academy for natural science. He died at Linz, 16th October, 1680. His memoirs, written in Italian, are distinguished for conciseness, clearness, and profound and scientific views. They were published at Milan in 1807 in two vols.; and at Turin in two vols. in 1821. His Commentarii Bellici, a semi-autobiographic memoir, was published at Vienna in 1718.

MONTEGO BAY, a seaport town, north-west coast of Jamaica, capital of county Cornwall, on a bay of same name, with a harbour protected by a breakwater, but still somewhat exposed to a heavy swell from the north. It is defended by a battery, has a court-house, where the assizes are held, and carries on a considerable trade. Pop. about 4000.

MONTÉLIMAR (Latin, *Mons Adhemari*), a walled town of France, in the department of Drôme, at the junction of the Roubion and Jabron. On a rising ground within it stands the castle, now used as a prison. It has a court of first resort, a communal college, manufactures of wrought silk, hats, leather, &c.; there are also foundries, tool-shops, and agricultural implement manufactories; and a trade in nougat (a kind of cake made of almonds and honey), corn, flour, nut and olive oil, spun silk, and cattle. It was one of the first towns which embraced the Reformation, and makes an important figure in the civil wars. Pop. 12,894.

MONTEM, a singular celebration which used to take place every three years at Eton School, England. There was a procession every third Whit-Tuesday to the Salt Hill (*ad montem*), when certain of the boys, clad in fanciful silk dresses, levied contributions *for salt* from all persons present, and from passers-by. The royal family, and many of the most distinguished personages in the empire, patronized these celebrations, and it is said that very large sums have been occasionally collected, which it was the custom to give for the support of the senior scholar at Cambridge. The custom, the origin of which is unknown, ceased to be observed in 1847.

MONTEMAYOR, JORGE DE, a celebrated poet, born about 1520 in the small town of Montemayor or Montemor, not far from Coimbra, in Portugal. He was much less indebted to study than to his natural genius, but he understood several living languages, and his translations from them are characterized by ease and faithfulness. In his youth he entered the military career, although his inclination attracted him to music and poetry. He afterwards went to Castile, and being destitute of other means of subsistence, joined the chapel of Philip II. as a singer, and accompanied that prince to Germany, Italy, and the Low Countries. After his return he appears to have lived in Leon, where he wrote his celebrated Diana Enamorada (Valentia, 1542, 4to),

which constitutes him the founder of the Spanish pastoral romance. Queen Catharine, sister of Charles V., and regent of the kingdom, called the poet to her court, and conferred on him an honourable post. By an elegy of Francisco Marcos Droantes, which is contained in all the editions of the Diana, it appears that he died at Lisbon as early as 26th February, 1562. Although a Portuguese by birth, he is considered as belonging to Spanish literature, as he wrote in Castilian. Cervantes calls the Diana the finest model of the pastoral romance. Besides that work, which is unfinished, we have a Cancionero (1554), or collection of his poems. The Diana has been translated six times into French.

MONTENEGRO (native, *Tzernagora;* Turkish, *Karadagh*, Black Mountain), a small principality in Europe, in the north-west of Turkey, bounded north by Bosnia and Herzegovina, east by Bosnia, south by Albania, and west by the Adriatic Sea and a strip of Dalmatia. Its area was increased by the treaty of Berlin of July, 1878, from about 1710 to about 3500 sq. miles. The general aspect of the country is that of a succession of elevated ridges, diversified here and there by a lofty mountain peak, some of them attaining elevations of 5000 or 6000 feet, or even 8000 feet on the borders of the country. In some parts it looks 'like a sea of immense waves turned into stone.' The whole territory, indeed, is wild and rugged in the extreme, but has also a few beautiful and verdant plains and valleys, in which the soil is tolerably fertile. Two of these favoured tracts are the department of Tzernitza and the valley of Bielopavlich, watered by several streams, the principal of which is the Morasa or Moratsa, which falls into the Lake of Scutari. The climate is healthy. Forests of valuable timber cover many of the mountain sides. The most common are oaks and holly, ash, beech, firs, walnuts, hazel, wild pears, poplars, willows, alders, and the sumach, used for dyeing and tanning. The cultivated productions are Indian-corn, potatoes, cabbage, cauliflower, and tobacco, with several kinds of fruit-trees, including the peach, olive, pomegranate, mulberry, and others. In the department of Tzernitza, already mentioned, apples, vines, carobs, almonds, figs, quinces, walnuts, &c., also grow in abundance. Agriculture is in a very rude and inefficient state, though every cultivable piece of land, even if only a few feet square, is planted with Indian-corn, potatoes, or some other useful plant. Sheep, goats, and pigs are reared in great numbers; the two former affording a profitable supply of wool and cheese for exportation. Game is not abundant, but fish are taken in great quantities, and are of excellent quality, particularly the trout, which are celebrated, and some of them of immense size; and a kind of carp is caught in large quantities, and dried and salted for export to Vienna and Trieste. Manufactures, with exception of a coarse woollen stuff, are unknown. The chief occupations of the inhabitants are agriculture and fishing; the latter carried on principally in the Lake of Scutari, which lies partly in Albania. The exports of Montenegro are smoked mutton-hams, salted fish, wax, honey, hides, tallow, cheese, butter, cattle, and other agricultural produce. The chief imports are cattle, tobacco, salt, wine, brandy, coffee, sugar, and manufactured goods. The Montenegrins belong to the Serbian branch of the Slavonic family of peoples. They are generally of tall stature, and well proportioned, with singularly powerful voices, which enables them to carry on conversations at incredible distances; foreheads good, face rather square, moderately aquiline or straight nose, and animated eyes. Both men and women are very robust: the latter are often beautiful when young but soon lose their good looks by laborious and unfeminine occupations, being the beasts of burden of Montenegro. The people generally are cheerful in manner, extremely brave, and hospitable and courteous to all except the Turks, whom they hate with an excessive and enduring hatred. The men go at all times fully armed, whatever be the occupation in which they are engaged. The Montenegrin mode of living is hardy and primitive, and their food simple, consisting chiefly of coarse unleavened bread made of Indian-corn, cheese, milk, and vegetables. Meat and fish they seldom taste. The houses are of stone, generally with thatched roofs, but many are covered partly or entirely with wooden shingles. There are no towns in Montenegro, but there are some 300 villages, one of which, Cettinje, is the capital. None of them are walled, and few can be said to have any streets. The language of the Montenegrins is a Slavonic dialect. In religion they are all of the Greek Church. Education, which was formerly much neglected, is now becoming freely diffused, the public schools having increased from one in 1851 to about sixty in 1884. Montenegro, until 1851, was governed by a Vladika or prince, who was at once a bishop, a judge, a legislator, and a commander-in-chief. The office was hereditary in the family of Petrovitch from 1697. But as the Vladika could not marry, the dignity was inherited through brothers and nephews. In 1851 the civil and ecclesiastical offices were disjoined, the Vladika confining himself to the latter, while the former devolved on the Hospodar. The present prince is Nicholas I. Petrovitch, who was proclaimed at Cettinje, the capital, after the death of Prince Danilo I. (13th August, 1860), the effect of a pistol-shot discharged at him by a discontented subject a few days before. Pop. about 236,000.

The history of Montenegro is a chequered one. It formed anciently a part of Illyria, and in the middle ages belonged to the great Servian Kingdom. The origin of the sacerdotal power dates from 1516, when the secular prince, having no children, withdrew to Venice, and transferred the government to the Archbishop Germanos. In the reign of Peter the Great the Montenegrins placed themselves under the protection of Russia, both sharing in a common enmity against the Turks. In 1796 the Prince-bishop, Pietro I., inflicted such a loss on the Pasha of Scutari, who had invaded Montenegro, that for many years they left it unmolested. Pietro II. (1830–51) made strenuous efforts to improve the condition of his people by liberalizing the constitution, and attempting to reclaim his subjects from their vindictive and predatory habits. His successor, Danilo I., having separated the civil and ecclesiastical offices, Russia withdrew her subsidy of 8000 ducats, but subsequently resumed payment of it, not, however, before great internal commotion had arisen from the necessary imposition of taxes to meet the deficit so caused. The Turks, led by Omar Pasha, again invaded the country, but a treaty was arranged February 15, 1853. In 1860 the Montenegrins excited a rebellion against the Turkish sway in the Herzegovina, the result of which was the infliction of such a chastisement on them that they were compelled (1862) to accept a disadvantageous peace, in which it agreed to the occupation of several points on the road from Herzegovina to Scutari by Turkish troops. In 1870, however, the principality managed to get these troops withdrawn. In 1876 Montenegro joined Servia in a war against Turkey, and on the conclusion of the Russo-Turkish war of 1877–78, it received, as already mentioned, an accession of territory by the treaty of Berlin. The expenditure of the principality is fully met by the revenue, and a debt contracted in 1876 was paid by Russia.

MONTE NOTTE, a village of Northern Italy, among the Apennines, in the province and 26 miles west of Genoa, territorial division of Liguria. On the 11th of April, 1796, the Austrians, commanded by General Argenteau, were defeated here by the French under Bonaparte; the imperialists are said to have lost 2000 men killed, and as many prisoners. The battle, however, has been called a mere affair of outposts. Under the first French Empire this village gave its name to a French department.

MONTEREAU, a town of France, in the department of Seine-et-Marne, 12 miles east of Fontainebleau, at the confluence of the Yonne and the Seine, both navigable, and each spanned by a bold bridge, and on a branch of the Troyes and Lyons Railway. It is commanded by a steep hill, crowned by the château of Surville, a handsome modern edifice, and is generally well built; has a collegiate church, a considerable trade, chiefly for the supply of Paris with flour, timber, cattle, &c.; and important manufactures of earthen and stone ware, in imitation of the English. In 1814 it was the scene of Bonaparte's last victory. Steamers ply hence to Paris. Pop. 7306.

MONTEREY, a city of the Mexican Confederation, capital of New Leon, on the San Juan, a tributary of the Rio Grande del Norte, at the head of a large and beautiful valley, 85 miles east by north of Saltillo, lat. 26° N.; lon. 100° W. It stands on a plateau 1626 feet above the level of the sea, and has well-paved streets, houses of stone in the Moorish style, with flat roofs, and is the most important place in Northern Mexico. Near it are gold, silver, and lead mines. It is so situated that its facilities for commerce are great, and it thus commands a great transport trade. It was besieged by the American forces under General Taylor in the war between the United States and Mexico, and after holding out for four days was compelled to capitulate, 24th September, 1846. Pop. 33,811.

MONTE ROSA. See ROSA.

MONTE-SAN-ANGELO, a town of Italy, Naples, in the province, and 28 miles north-east of Foggia, on the south slope of Mount Gargano, defended by a strong castle, the see of a bishop; with a great number of churches, and the remains of a Roman temple. It has a famous sanctuary, to which crowds of devotees repair from all parts of the kingdom on the 8th of May. Pop. 17,242.

MONTE SANTO. See ATHOS.

MONTESPAN, FRANÇOISE ATHENAÏS DE ROCHECHOUART DE MORTEMART, MARCHIONESS DE, mistress of Louis XIV., born in 1641, the second daughter of the Duke of Mortemart, in 1663 married to the Marquis de Montespan. To the most fascinating beauty she also added a natural liveliness and wit, and a highly cultivated mind. Her conversation was gay, natural, and *piquante*. On her first appearance at court, as the queen's *dame du palais*, Mlle. de la Vallière possessed the favour of the monarch; but the grace, beauty, and wit of the lovely marchioness soon made an impression on him (1668), and it was not long concealed from the courtiers—although the pious queen was slow to credit it—that, while that voluptuous prince already had one mistress at court, he was living in double adultery with another. Her husband had been ordered to retire to his estates, and Mme. de la Vallière withdrew in 1674. The first child of this adulterous connection was born in 1672, and the birth was carefully concealed. The education of the children was committed to Mme. Scarron, afterwards De Maintenon, under the strictest injunctions of secrecy; but this exterior of decency was soon laid aside, and they were openly avowed. The influence of the favourite mistress was often exercised in public affairs, and her advice was often formally asked and followed. Several transient passions of the king still left her her power, until age and long possession, remorse, and a growing attachment to Mme. de Maintenon finally overcame his passion, and the frequent quarrels of the two ladies finally estranged his affections from Mme. de Montespan. She rarely appeared at court after 1685, and in 1691 she entirely quitted it. Her last years were devoted to religious exercises, acts of benevolence, and penitence. She died 28th May, 1707.

MONTESQUIEU, CHARLES DE SECONDAT, BARON DE LA BRÈDE ET DE, was descended from a noble family of Guienne, and was born January 18, 1689, at the castle of Brède, near Bordeaux. When only twenty years old this philosophical genius collected materials for his Esprit des Lois. An uncle, who was president of the Parliament of Bordeaux, left him his property and office. In this sphere of action Montesquieu tried to be useful in various ways. In the Academy which was formed at Bordeaux he delivered many excellent lectures on history, sought to attract attention to the natural sciences, in his time almost entirely neglected, and for that purpose projected the plan of a Histoire physique de la Terre, ancienne et moderne (which, however, as his efforts were afterwards turned in other directions, was never finished), &c. In 1721 he came before the public with his Lettres Persanes, which he had begun in the country, and finished in the leisure hours that his business left him. This work, profound under the appearance of levity, announced a distinguished writer. It gives a most lively and correct picture of French manners; with a light and bold pencil he portrays absurdities, prejudices, and vices, and has the skill of imparting to all an original character. All his letters are, however, not of equal value; some contain parodoxes and coarse satires against the reign of Louis XIV. These letters introduced Montesquieu into the French Academy, although this society was by no means spared in them; and Cardinal Fleury, justly offended at the Persian's mockery of the Christian religion, opposed his reception. The discourse which he delivered on the occasion of his admission in 1728 was short but energetic, and rich in ideas. In order to collect materials for his great work, the Esprit des Lois, he resigned his office in Bordeaux in 1726, and after his reception into the Academy began to travel through Germany, Hungary, Italy, Switzerland, Holland, and England. In the last country he spent about two years, and was made member of the Royal Society of Sciences in London. The result of his observation was that Germany was the place to travel in, Italy to reside in for a time, England to think in, and France to live in. After his return to his château la Brède he finished his work Sur les Causes de la Grandeur et de la Décadence des Romains, which first appeared in 1734. His acute remarks and excellent delineations gave to this trite subject the interest of novelty. The lofty spirit which shines in this book is still more conspicuous in the Esprit des Lois, which appeared in 1748. In this work, which exhibits the laws of states in their broad connection with the other elements of public life, the author distinguishes three forms of government—the democratic, the monarchical and the despotic, and shows that the laws must correspond to the principles of these forms. The distinction is of great importance, and leads the author to a great variety of deductions. This work may be termed a code of national law, and its author may be termed the legislator of the human family. In consideration of these sentiments Montesquieu may be forgiven for labouring to reduce everything to a system; ascribing to climate and physical causes

too much influence over the morals; for the irregularity of his work as a whole, and for having too often drawn general inferences from single cases. But it has been justly complained that we find in this *chef d'œuvre* many excessively long digressions respecting the feudal laws; also the testimony of travellers of doubtful credit; paradoxes instead of truths, and jests instead of reflections. It is, however, undeniable, that this book is for the philosopher a storehouse of investigations; and no one has ever reflected more profoundly than Montesquieu on the nature, foundation, manners, climate, extent, power, and peculiar character of states; on the effects of rewards and punishments; on religion, education, and commerce. To a criticism by the Abbé Bonnaire, Montesquieu replied in his Défense de l'Esprit des Lois. He died at Paris, February 10, 1755, at the age of sixty-six years. Although economical by nature, he could be generous, as in the well-known instance of his bounty at Marseilles, where he gave his purse to a young boatman, and secretly appropriated a considerable sum to release the father of the unhappy man, who had fallen into the hands of Barbary corsairs. It was not discovered till after Montesquieu's death that he was the liberator of the captive. A note respecting the remittance of a sum of money to a banker, found by his executors among his papers, led to the discovery of this act of liberality. It has given occasion to the drama Le Bienfait anonyme. After his death a collection of his works was published at London, in 1759 (three vols. 4to). In 1788 there appeared a good edition (in five vols.), to which must be added a volume of Œuvres Posthumes that appeared in 1798. Very complete editions are those of Basle, of 1779, in eight vols., and of Paris, 1796, in five vols. They contain several other works of Montesquieu, such as the Temple de Gnide, a kind of poem in prose. A history of Louis XI., which he had commenced, and according to some authorities completed, was lost, being burned by the author by mistake. Under the name of Charles d'Outrepont, Montesquieu has unveiled the soul of a tyrant, in a conversation between Sulla and Eucrates. Of his Lettres familières, which appeared in 1767, several are interesting. In his twenty-sixth year Montesquieu married, and the fruits of this marriage were one son and two daughters. The first published a curious little romance in 1783, Arsace and Isménie, which was probably written by Montesquieu in his younger years, and perhaps intended originally, as Grimm suggests, to form an episode in the brilliant and amusing, but at times somewhat scandalous, Lettres Persanes. Montesquieu's complete works, with the variations of the original editions, and the notes of all the commentators collected and arranged by M. Parelle (Paris, 1826, eight vols. 8vo), is now reckoned a valuable edition, and commands a high price in the market. A more recent edition of equal literary value is that of E. Laboulaye (seven vols. Paris, 1875-79). A biography of Montesquieu by Louis Vian has been published (Paris, 1879).

MONTE-VIDEO, a seaport town, capital of the Republic of Uruguay, formerly called the Banda Oriental, on the north coast of the estuary of the La Plata, 130 miles east-south-east of Buenos Ayres. It is situated on a gentle elevation at the extremity of a small peninsula, and is divided into two parts, an old and a new town, between which traces of the old ramparts may still be seen. The streets are regular, well-paved, and lighted with gas, and there is an extensive tramway system. The houses are mostly of one or two stories, and flat-roofed. The principal buildings are the cathedral, the town-house, the market, exchange, &c. The harbour is unfortunately of little depth, having only from 14 to 19 feet water, but the bottom being very soft, vessels receive no damage by grounding. The chief exports are wool, hides, tallow, dried or jerked beef, and the extract of flesh manufactured by the Liebig and other companies on the river Uruguay. The imports principally consist of British cottons, woollens, hardware, and other manufactured articles. Montevideo sends out above half the whole exports of Uruguay, and receives all but a small fraction of the imports. British vessels have the chief share of the shipping. The climate is humid, and the weather in the winter months, June, July, and August, is at times boisterous; and the air keen and piercing. In summer, again, the heat is oppressive. The climate, however, is represented as being on the whole cheerful and healthy, though moist; the soil in the neighbourhood fertile, and abounding in vegetable productions. Flesh and fish are cheap. Pop. in 1879, 73,353.

MONTEZUMA, Emperor of Mexico at the time of the Spanish invasion. In 1519, when Cortez arrived on the coast of Mexico, Montezuma, terrified by an old prophecy, and awed by the striking appearance of the invaders, received their commander as his master. But when he discovered that the strangers were no supernatural beings, he secretly took measures for their destruction. When Cortez learned this he seized Montezuma, and having put him in chains compelled him to recognize the supremacy of Spain. A rising having in consequence taken place among the Mexicans, Montezuma was induced to advance to the battlements of the Spanish fortress in his royal robes, and attempt to pacify his subjects. His address only excited indignation, and being struck on the temple with a stone he fell to the ground. Every attention was paid to him by Cortez, from motives of policy; but rejecting all nourishment, he tore off his bandages, and soon after expired, spurning every attempt at conversion. This event took place in the summer of 1520. He left two sons and three daughters, who were converted to the Catholic faith. Charles V. gave a grant of lands, and the title of *Count of Montezuma* to one of the sons, who was the founder of a noble family in Spain, the last descendant of which died at New Orleans in 1836.

MONTFAUCON, Bernard de, a French Benedictine, of the congregation of St. Maur, celebrated as a critic and antiquary, was of noble descent, and was born at the castle of Soulage, in Languedoc, in 1655. When young he engaged in military service, but in 1675 he entered the congregation of the Benedictines of St. Maur, and zealously applied himself to studies in philosophy, theology, history (both Biblical and profane), and ancient and modern languages and literature. In 1688 he published, conjointly with Fathers Lopin and Pouget, a volume entitled Analecta Græca, sive Varia Opuscula. One of his great undertakings was an edition of the works of Athanasius, which appeared in 1698 (in three vols. folio). He then visited Rome, where he exercised the functions of agent-general of the congregation, and was received by Pope Innocent XII. with great distinction. On his return from Rome he published an account of his observations under the title of Diarium Italicum; and in 1706 a collection of the works of the ancient Greek fathers, with a Latin translation, notes, and remarks. In 1708 appeared his Palæographia Græca, sive de Ortu et Progressu Literarum Græcarum, a work the object of which is to show how the age of Greek manuscripts may be determined by the formation of the letters in which they are written. Among his subsequent labours are the Hexapla of Origen (1713, two vols. folio); an edition of the works of Chrysostom (thirteen vols. folio); and Les Monumens de la Monarchie Française (five vols

folio, Paris, 1729–33). His works in folio alone form forty-four volumes. The most important of his productions is the treasury of classical archæology, entitled L'Antiquité expliquée et representée en Figures, with the Supplement, fifteen volumes, folio, containing 1200 plates representing nearly 40,000 objects of antiquity (Paris, 1719–24). His death took place at the Abbey of St. Germain-des-Prés, 1741. English translations have been published of the Diarium Italicum and Antiquité expliquée and an English work entitled Regal and Ecclesiastical Antiquities of France is reduced from Les Monumens de la Monarchie Française.

MONTFERRAT (*Monferrato*), formerly a duchy of Italy, bounded by Piedmont, Genoa, and the Milanese territory. It lay in two detached portions between the Maritime Alps and the Po, and had an area of about 1000 square miles. The capital was Casale. Mention is made of a Marquis of Montferrat in 950. In 1305 the marquisate was inherited by a branch of the imperial family of the Palæologi, and in 1536 was granted by Charles V. to Federico II., duke of Mantua. It was erected into a duchy by Maximilian in 1573 or 1574. In 1631 a considerable part of it was ceded to Savoy by the Duke of Mantua, to whose ancestors Charles V. had granted it in 1536. In 1708 the remainder was annexed to the same duchy by the Emperor Joseph. Since that period it has shared the fate of Savoy. See MANTUA and SAVOY.

MONTFORT, SIMON DE, Earl of Leicester, son of Simon de Montfort, who distinguished himself by his activity, zeal, and severity in the crusade against the Albigenses, was born in France about the beginning of the thirteenth century, but when grown up quitted his native country on account, it is said, of some dispute with Queen Blanche, and came to settle in England, where he soon attained a high degree of rank and influence. His grandmother, Amice de Beaumont had been the sister and heiress of Robert of Leicester, so that the earldom of Leicester ought to have passed into the family of Montfort. Instead of this it was conferred upon Ranulf, earl of Chester, the husband of a daughter of Amice de Beaumont, but when Ranulf died, and Amaury, the eldest brother of Simon de Montfort, renounced the honour, Henry III. bestowed it in 1231 upon Simon himself. This was the first step in his upward course, but he rose to still higher dignity when he acquired the favour of the king's sister, the Countess Dowager of Pembroke, whom he privately married in 1238. Henry soon after appointed him seneschal of Gascony, where he ruled so despotically that the inhabitants sent a deputation to the king, declaring that they would renounce their allegiance if Montfort was not removed. He was accordingly recalled, and according to some accounts examined before the lords, but acquitted. A violent personal altercation between the king and the haughty earl ensued, in which the former applied the opprobrious epithet of *traitor* to his subject, and the latter gave his sovereign the lie. A reconciliation was, however, effected, and De Montfort was employed on several occasions in a diplomatic and military capacity. As the dissatisfaction of the barons with the government assumed a more decided tone the name of this nobleman is more frequently mentioned. He concerted with the principal barons a plan of reform and in 1258 they appeared in Parliament armed, and demanded that the administration should be put in the hands of twenty-four barons, who were empowered to redress grievances, and to reform the state. These concessions were called the *Provisions of Oxford*, the Parliament (called the Mad Parliament) having been holden at that place. The administration of the twenty-four guardians, at the head of whom was Leicester, continued for several years. In 1262 Henry made an attempt to escape from their authority, but was constrained to submit by the vigour and activity of Leicester, and agreed that their power should be continued during the reign of his successor. This stipulation soon led to new troubles, and both parties finally consented to refer the subject to the arbitration of St. Louis. The barons refused to abide by his decision, and hostilities again commenced which resulted in the triumph of Leicester, at the battle of Lewes (May 13, 1264). His arrogance and rapacity seem to have raised a powerful party against him among the barons, and, according to some, this was the motive which induced him to summon knights of shires and burgesses to the Parliament which met in 1265. Whatever may have been his motives, however, he thus became the founder of the English House of Commons. In the same year he fell at the battle of Evesham (August 4, 1265), in which the royal forces were led by Prince Edward. In attempting to rally his troops, by rushing into the midst of the enemy, he was surrounded and slain. His body, after being mutilated in the most barbarous and indecent manner, was laid before Lady Mortimer, the wife of his implacable enemy. His memory was long revered by the people as that of one who died a martyr to the liberties of the realm. During the succeeding reign this feeling was discouraged, but in the next generation he was called *St. Simon the Righteous*. Miracles were ascribed to him, and the people murmured that canonization was withheld from him. Though Simon de Montfort was slain, his lifeless remains outraged, and his acts branded as those of a usurper, yet, in spite of authority and prejudice, his bold and fortunate innovation survived. He disclosed to the world (whether conscious or not of the importance of his measure) the great principle of popular representation, which has drawn forth liberty from the walls of single cities, has removed all barriers to the extent of popular governments, and has given them a regularity, order, and vigour which put to shame the boasted energy of despotism. See ENGLAND—History, and HENRY III.

MONTGOLFIER, JOSEPH MICHEL (1740–1810) and JACQUES ÉTIENNE (1745–1799), two brothers, sons of a paper-maker in France in the town of Vidalon-les-Annonai, in the department of Ardèche, and joint inventors of the balloon. They both devoted themselves to the study of mathematics, mechanics, physics, and chemistry, and the latter also studied architecture. They were both of an inventive turn of mind, but as their scientific labours were always carried on in combination it is not very easy to decide to which of the two the credit of their several inventions is due. The first idea of the balloon seems to have arisen in the mind of Joseph, but Jacques Étienne suggested many improvements upon it. Joseph was also the inventor, among other things, of the water-ram which raises water to the height of 60 feet, and Jacques Étienne of vellum paper, which he was the first to make in the manufactory formerly carried on by his father. The former died at Balaruc, the latter at Serrières. See AERONAUTICS.

MONTGOMERY, or MONTGOMERYSHIRE, an inland county in North Wales; bounded on the north by Denbighshire, on the east and south-east by Shropshire, on the south by Radnorshire, on the south-west by Cardiganshire, and on the west and north-west by Merionethshire. Area, 495,082 acres, consisting mostly of wild, rugged, and sterile mountains, varying from 1000 to 2000 feet in height. Notwithstanding the generally mountainous character of the county, it contains some fine and fertile valleys, the most

extensive and fruitful of which is that of the Severn. The county is almost entirely occupied by the slate-rocks which overspread so large a portion of Wales; but granite, greenstone, conglomerate, and the new red sandstone, also occur in different places. Lead and zinc are procured, and also some copper. The cultivation of the soil is carried on chiefly in the narrow valleys, and on the east side of the county, bordering on Salop. Wheat and oats are the principal crops, the former covering 15,730 acres in 1883, and the latter 25,122 acres. The total surface in corn crops in that year was 51,464 acres. Orchards and gardens are numerous in the vale lands on the east side of the county. In the hilly districts the principal object of the farmer is the rearing of cattle, to be fattened in more fertile parts. The cattle of the uplands are small; breeds of sheep various. Great numbers of very small and hardy ponies, commonly called *merlins*, are reared in the hilly districts of the county. Flannels are manufactured, as are also a kind of cottons called 'Welsh plains.' The principal river is the Severn. Montgomery is the county town, but the largest town is Welshpool. The county sends a member to Parliament. Pop. in 1881, 65,718.

MONTGOMERY (Welsh, *Trefaldwyn*, that is Baldwin's town), a town in Wales, in the county of Montgomery, 53 miles west by north of Birmingham. It has a fine ancient cruciform church in the early English style. It belongs to the Montgomery district of boroughs, which includes Llanfyllin, Llanidloes, Machynlleth, Montgomery, Newton, and Welshpool. On a hill above the town are the ruins of a castle, founded in the reign of William the Conqueror, and held originally by Roger de Montgomery, from whom the town was named. Pop. 1194.

MONTGOMERY, a city of the United States, capital of Alabama, is situated on a high bluff on the left bank of the Alabama river, 160 miles north-east of Mobile, with which it has communication by rail (180 miles) and by steamer (300 miles). The principal buildings are the state-house, a fine Grecian domed edifice on Capitol Hill; the court-house; the city hall and market; two theatres; numerous churches and schools, &c. The chief manufacturing establishments are several foundries and machine-shops, flour and oil mills, and a cotton factory. Montgomery is the centre of a large and fertile cotton district, and carries on an extensive trade in cotton, groceries, and manufactured goods. The city was founded in 1817, became the state capital in 1847, was seized by the Federal troops under General Wilson in April, 1865, when the arsenal, railway-stations, and foundry were destroyed. Pop. (1880), 16,713.

MONTGOMERY, Alexander, a Scottish poet who flourished during the latter half of the 16th century, was born at Hazelhead Castle in Ayrshire. Of the earlier part of his history little is certainly known. He is commonly spoken of by his contemporaries or their immediate successors as a captain, and it has therefore been presumed that he served as a soldier. At one period he appears to have been in the service of the regent Morton, and during the course of his life he seems to have experienced the fluctuating fortune of a courtier. Shortly after the accession of James VI. to power, that learned monarch appears to have employed the poet in some capacity or other and to have granted him a pension; he fell into disgrace for some time, but was subsequently restored to favour and accompanied his royal patron to London. His death occurred probably between 1605 and 1610. His principal poem, the allegory of the Cherry and the Slae, was first published in 1597. Many of his sonnets and miscellaneous pieces, some of which have considerable merit, were written much earlier and circulated in manuscript. An edition of his poems, with biographical notices by Dr. Irving, was published in Edinburgh in 1821.

MONTGOMERY, James, a poet of great merit, was born on 4th November, 1771, at Irvine, Ayrshire, where his father was a Moravian preacher. He was educated at the Moravian school of Fulneck near Leeds, and at the age of sixteen, as he showed no disposition to enter the ministry, for which he was intended, was placed as an assistant in a chandler's shop. Disliking this employment he ran away at the end of a few months. In 1792 he found his way back to Yorkshire, and procured an engagement with a bookseller in Sheffield, the proprietor, editor, and publisher of the Sheffield Register. His master having been obliged to take to flight in order to escape a political prosecution, Montgomery succeeded him as editor and publisher of the paper, the name of which he changed to the Sheffield Iris. The conducting of a liberal journal was at that period fraught with manifold dangers, and it was not long before the editor, notwithstanding his gentleness and prudent management, experienced a specimen of the annoyances attendant on his position. He was twice prosecuted for trivial offences, and condemned on the first occasion to three and on the second to six months imprisonment. During his confinement he composed a small volume of poems, entitled Prison Amusements, published in 1797. After his release he continued his poetical exercitations, and in 1806 appeared his Wanderer in Switzerland, the first effort of his which gained the approbation of the public, though severely handled by the Edinburgh Review. It was followed in 1809 by the West Indies, a poem containing some good descriptive passages, and others of no little power and pathos, designed to expose the iniquities of the slave-trade. In 1813 appeared the World before the Flood; in 1819 Greenland, a missionary poem, with many fine descriptive scenes; and in 1827 The Pelican Island was given to the world. Each of his larger works had a collection of smaller pieces appended, which, from the beauty and pathos of many of them, are perhaps the most likely to transmit his name to posterity. In 1825 he resigned the editorship of the Iris, and henceforward spent his life in religious and literary labours, composing and editing various sets of hymns, taking part at religious meetings, and generally busying himself in all benevolent and useful schemes. He died at his residence of the Mount, Sheffield, on 30th April, 1854. A pension of £150 a year had latterly been conferred on him by government.

MONTGOMERY, Robert, a prolific if not a great poet, was born at Bath in 1807, and when very young conducted for a time there a weekly periodical called The Inspector. In 1827 he published the Age Reviewed, a Satire, and the following year his celebrated poem, the Omnipresence of the Deity, which achieved an astonishing success. It was mercilessly scourged by Macaulay in the Edinburgh Review, and of the general justness of his strictures on it there can be little doubt, although somewhat severely and acrimoniously expressed. Another poem, published shortly afterwards, was Satan, which attracted no less attention, and procured for the author the *soubriquet* of Satan Montgomery. In 1830 he entered Lincoln College, Oxford, took his degree of B.A. in 1833, and in 1835 was ordained a clergyman of the Church of England. His first charge was the curacy of Whittington in Shropshire, from which he passed to Percy Street chapel, London, and in 1838 to St. Jude's Episcopal chapel, Glasgow. His peculiar style of preaching in the last place having provoked much dissension, he resigned his charge in 1842, and

returned to Percy Street chapel, where he officiated till his death at Brighton, on 3d Dec. 1855. Among his numerous other works are his Messiah, a Poem in Six Books, Luther, or the Spirit of the Reformation; Sacred Meditations and Moral Themes; The Christian Life, a Manual of Sacred Verse; and The Sanctuary, a Companion in Verse for the English Prayer-book.

MONTH, a period of time derived from the motion of the moon. The 'sidereal' month may be regarded as the period in which the moon, as seen from a fixed star, would appear to make a complete revolution round the earth; it is evidently the period in which she passes through the twelve signs of the zodiac; its mean value during the year is 27·32166 days. The 'synodical' month, more commonly called a 'lunar month' or 'lunation,' is the period during which the moon goes through all her phases, it is usually reckoned from new moon to new moon; to complete the lunation the moon must not only pass through the twelve signs of the zodiac, but also come again to occupy her old position relatively to the sun, which has itself advanced in the zodiac, hence the lunar is longer than the sidereal month. The mean value of the lunation is 29·5306 days. The 'solar' month is the twelfth part of one solar year, or 30·4368 days. The 'anomalistic' month is the period in which the moon passes from perigee to perigee of her orbit; it differs from the sidereal month because the perigee varies its position. The line of nodes of the moon's orbit varies its position, and the 'nodical' month, or the period of her motion from ascending to ascending node, differs from the other months mentioned above. The twelve civil or calendar months of the year have from twenty-eight to thirty-one days each. See CALENDAR.

MONTI, VINCENZO, one of the most celebrated modern poets of Italy, born at Fusignano, in the territory of Ferrara, in 1754. After being educated first at Faenza, and afterwards at Ferrara, he went to Rome, where he was appointed secretary to Luigi Braschi, nephew of the pope. As he wore the clerical dress he was called *Abbate Monti*. The Arcadia received him as a member. Excited by the fame of Alfieri, he wrote two tragedies—Galeotto Manfredo and Aristodemo—the splendid style of which was indeed admired, although the plots were thought too tragic, and dramatic action was wanting. The murder of the French ambassador Basseville at Rome in 1793 gave occasion to the poem Basvilliana, in which he closely imitates Dante. This work, distinguished for the splendour of some of its passages, gained him a well-deserved reputation. Two other poems, the Musogonia and Feroniade, are filled with reproaches against Bonaparte and his army; but these are little known in their original form, for the French having soon after entered Rome, the author suppressed the first edition, and prepared a second, in which the reproaches formerly directed against the French were levelled against the allied princes. Having previously exhibited himself in his Basvilliana as a hot conservative, a hater of republics, and an execrator of regicides, Monti now turned a rabid republican, was appointed secretary of the directory of the Cisalpine Republic in Milan, and while holding this office composed a savage song to be sung at the theatre of La Scala on one occasion in celebration of the execution of Louis XVI. The campaign of Suvaroff in Italy in 1799 obliged him to flee to France. The battle of Marengo restored him to Milan, where he sung the Death of Mascheroni. This poem excited almost as much admiration as the Basvilliana, but, as some satirical hits gave offence, he did not finish it. He was scarcely appointed professor of belles-lettres at the College of Brera when he received an invitation to Pavia as professor of eloquence. He afterwards became court poet at Milan, and finally, after the coronation of Napoleon as king of Italy, was appointed by him historiographer of the Kingdom of Italy, with the charge of celebrating his achievements. Accordingly the poet composed his Bardo della Selva nera, of which six cantos appeared in 1806. This very singular work met with strong disapprobation, against which Monti attempted a vindication in a letter to Bettinelli. He then went to Naples to join Joseph Bonaparte, where he published the seventh canto of the Bardo, which was received with no more approbation. His tragedy Caio Gracco likewise found little favour, as also some musical dramas. The poetry was considered as too close an imitation of Dante, though not without many beauties. Besides his original works Monti published editions of the Convito, Vita Nuova, and Rime of Dante, and translated the Satires of Juvenal, and (without, as he confessed himself, understanding Greek) the Iliad of Homer. He died in October, 1828 (according to some authorities, 1827). Monti cannot be denied the praise of great poetic talent; his countrymen called him *il Dante ingentilito*. His Proposta di alcune Correzioni ed Aggiunte al Vocabolario della Crusca contains a treasure of critical and lexicographical information on the Italian language. A complete edition of his works was published at Florence in 1847.

MONTILLA, a town in Spain, Andalusia, in the province of Cordova, and 19 miles south of the town of Cordova. The parish church was formerly a mosque, and there is a palace belonging to the Duke of Medina-celi. The celebrated warrior, Gonsalvo de Cordova, was born here. Pop. 13,207.

MONTLUÇON, a town in France, department of Allier, on a slope above the Cher, here crossed by a handsome bridge 39 miles south-west of Moulins. Its castle, whose ruins still frown from a height above the river, possesses much historical interest, and the whole town during the middle ages was regarded as a strong fortress. Portions of the walls, flanked with massive towers, still remain. The modern town is tolerably well built. The manufactures are glass, iron, cutlery, wool, hats, chemical products, &c. Pop. (1881), 26,079.

MONTMORENCY, ANNE DE, peer, marshal, and Constable of France, and a distinguished general, born in 1492 or 1493. At the very beginning of his career he attached himself to the service of the Duc D'Angoulême (afterwards Francis I.) The first battle at which he was present was Ravenna in 1512 under Gaston de Foix. He distinguished himself at the battle of Marignano in 1515, supported Bayard in his defence of Mezières in 1521, and for his valour at Bicoque in 1522 was made marshal. He was taken prisoner at the battle of Pavia, which was fought against his advice, in 1525, but was soon after ransomed, and took an important part in the negotiations which led to the Peace of Madrid in 1526. He was rewarded with the government of Languedoc and the office of Grand Master of France, and was intrusted with the administration of the affairs of state. In his management of the finances he was chiefly remarkable for his parsimony. In 1536 he caused the army of Charles V., which had entered Provence, to be destroyed by famine, and by his strategy on this occasion earned the title of the 'French Fabius.' In recognition of his various important public services Francis conferred on him the dignity of Constable in 1538. In 1541, however, he was disgraced in consequence of a court intrigue; but on the accession of Henry II. recovered his former influence. In 1557 he lost the battle of St. Quentin against Philip II. of Spain, and was taken prisoner, but he regained his freedom by

the Peace of Cateau-Cambrésis in 1559. Owing to the hatred of Catharine de' Medici he again lost his influence on the death of Henry II., but the risings of the Huguenots occasioned his recall to the court of Charles IX., and he joined the Duke of Guise in opposition to Condé, who was at the head of the Protestants. The consequence was a civil war, which broke out in 1562. In the battle of Dreux Montmorency was made prisoner by the Huguenots, and Condé was captured by the royal troops. The former was liberated the next year, and shortly after recovered Havre from the English. In the second civil war he gained a decisive victory over the Huguenots at St. Denis, November 10, 1567, but died of the wounds received in the action.

MONTMORENCY, Falls of, a beautiful cascade on a river of the same name, in Lower Canada, 7 miles below Quebec. The falls are very near the junction of this river with the St. Lawrence. The breadth of the river at the top of the cascade is about 100 feet, and the perpendicular descent 242 feet.

MONTMORENCY, Henry II., Duc de, born 1595, was in his eighteenth year created Admiral of France. He inherited from his father the government of Languedoc. After having defeated the Calvinists in that province, and taken from them several strong places, he gained a victory over them by sea near the islands of Oléron and Rhé, which fell into his hands (1625). In 1628 he gained decisive advantages over the Duke de Rohan, leader of the Huguenots. During the war against Mantua in 1630 he held the chief command in Piedmont, and at Veillane or Avigliana defeated the Spaniards under Doria, although they were superior to him in number. This victory was followed by the relief of Casale, and his services were rewarded with the marshal's baton. Montmorency now thought himself powerful enough to brave the influence of Richelieu, and with Gaston, duke of Orleans, who was equally dissatisfied with the cardinal, raised the standard of rebellion in Languedoc. La Force and Schomberg were sent against them; they met near Castelnaudary on the 1st of September, 1632, and Montmorency, who, to inspirit his men, had thrown himself into the royal ranks, was wounded and made prisoner. Gaston remained inactive. All France, mindful of his services, his virtues, and his victories, desired that the rigour of the laws might be softened in his favour; but Richelieu was resolved to make an example of the bravest, most generous, and most amiable man in France, and the marshal was condemned to death by the parliament of Toulouse. The king extended his mercy so far as to allow the execution to be private, and it took place in the hôtel de ville in Toulouse, October 30, 1632.

MONTORO, a town of Spain in Andalusia, 27 miles north-east of Cordova, on a rocky peninsula formed by the Guadalquivir, which is here crossed by a handsome bridge, The neighbourhood abounds with quarries of millstones, limestone, rock-salt, and pitchstone, as well as mines of antimony, copper, and cobalt, but these have been abandoned. There are woollen and linen manufactures, several fulling and flour mills, and numerous oil-mills. The principal article of export is oil, which is about the best in Andalusia. Pop. 13,293.

MONTPELLIER, a town in France, capital of the department of Hérault, finely situated on an undulating acclivity, washed by the Lez, about 6 miles north of the Mediterranean, and 79 miles W.N.W. of Marseilles. The landscape of the vicinity is remarkable for its richness and beauty, and the town itself had formerly a great reputation for the salubrity of its climate, but this reputation it has now lost. It is one of the handsomest towns of the south of France. The town, inclosed by an old wall in ruins, and defended by a citadel of no great strength, rises in the form of an amphitheatre, along a slope, the summit of which, 168 feet above sea-level, is occupied by the Place de Peyrou, forming part of the splendid promenade of the same name. At one of its extremities stands the Château d'Eau, a kind of fountain-temple, which receives its water from a noble aqueduct of fifty-three large arches and 2896 feet in length, led across the valley from an opposite hill, and sends down copious supplies to every quarter of the town. The principal structures are the cathedral, a large edifice, but of no great architectural merit; the old episcopal palace, now occupied by the school of medicine, the theatre, the exchange, with a fine Corinthian colonnade; Palais-de-Justice, and triumphal arch, of the Doric order, forming the gateway of Peyrou. The ancient university (founded in 1196) is now represented by the three faculties of medicine, science, and letters. The medical faculty, a school of great celebrity (said to have been founded by Arab physicians driven out of Spain), has valuable anatomical collections, and splendid amphitheatre; the botanical garden is an extensive establishment, the public library, the Musée Fabre, a picture-gallery, remarkably rich in works of the best masters; several large and well-managed hospitals, particularly the general hospital and Hôtel Dieu St. Eloi, central house of correction, &c, are the chief public institutions. There is a lyceum, a school of pharmacy, normal schools, diocesan seminary, art schools, &c. Montpellier is the see of a bishop, and the seat of a high court, with jurisdiction over departments Hérault, Aveyron, Aude, and Pyrénées-Orientales, and of a court of first resort and commerce. It has manufactures of woollen cloth, woollen covers, muslin, napkins, stearic candles, weighing instruments, verdigris, mineral acids, and other chemical products; corks, liqueurs, perfumes, besides stone-cutting establishments, cotton-mills, tanneries, sugar-refineries, and numerous distilleries of brandy and spirits. The harbour of Juvenal, formed by the Lez, and not a mile distant from the town, gives great facilities for trade; the principal articles of which are wines, brandies, spirits, olive-oil, fruits, leather, wool, copper, verdigris, &c. The religious wars in the sixteenth and seventeenth centuries proved very disastrous to this town, especially on the occasion of its siege and capture by Louis XIII. in 1622. The edict of Montpellier, promulgated Oct. 20, 1622, granted the free exercise of their religion to Protestants, and confirmed the Edict of Nantes. The University of Montpellier, founded in 1289, had been chiefly celebrated as a school of medicine. Montpellier is the birth-place of Barthez the physiologist, Broussonnet the naturalist, La Peyronie the surgeon, Cambacérès the statesman, Séb. Bourdon the painter, and others. Pop. (1876), 55,258.

MONT PERDU, summit of the Pyrenees, on the frontier line between France and Spain, about 100 miles east of the Bay of Biscay, and further west from the Mediterranean. It has a double summit; the loftier of the two peaks has an elevation of 10,994 feet above the level of the sea. The line of perpetual congelation here is about 7500 feet in height.

MONTREAL, a city and river port in British America, in the province of Quebec, 140 miles south-west of the city of Quebec, and 320 miles north of New York. It is the commercial capital of the Dominion of Canada, a position which it owes to its favourable situation, being at the head of the ordinary navigation from the Atlantic, and at the foot of the grand chain of canals which connects the great Lakes Ontario, Erie, Huron, and Superior with the river and the ocean. Montreal is built on an island of the same name, and occupies a low tract of land,

about 2 miles wide, between a considerable and very beautiful elevation, called Mount Royal (Mont Real), and the river, and is divided into the upper and lower town. The latter is mainly in the French style, is ill paved, and of a sombre aspect. The former is much more agreeable, and when seen from a distance has a striking effect, on account of the houses being mostly roofed with tin or sheet-iron. The more remarkable public buildings, most of which are in the principal street, Rue Notre Dame, are the town-hall, the seminary of St. Sulpice, the Hôtel Dieu, a large hospital for the reception of the sick poor; the convent of Notre Dame; government house, Nelson's Monument, the Quebec barracks, the Roman Catholic parish church, completed in 1829, in the perpendicular style, and esteemed one of the finest buildings in North America; the Roman Catholic cathedral, now in course of erection in the style of St. Peter's at Rome; the episcopal cathedral, and the Bonsecours market-house, a magnificent pile, fronting the wharf. The educational means of the city comprise the university of M'Gill College, embracing the faculties of arts, law, and medicine, and also a department of practical science; colleges and theological schools for Roman Catholics, Episcopalians, and other religious bodies, several classical and scientific academies, &c. The harbour, which is formed toward the St. Lawrence, is secure, and the quays, extending for several miles along the river, are unsurpassed in America. In 1882 the number of sea-going vessels arriving was 648, of which more than a half were ocean steamers, besides which the inland vessels entering the port numbered 6543. The river St. Lawrence is now navigable to Montreal for vessels of 4000 tons. The exports are chiefly the products of the country, such as grain, flour, &c., and there is a large export of furs. The principal imports are cottons, woollens, and silks, iron and hardware, and tea and sugar. The value of the exports in 1882 was £5,267,000; of the imports, £9,950,000. Among the industrial establishments of Montreal are cast-iron foundries, distilleries, breweries, soap and candle works; and there are manufactures of hardware, including excellent cutlery; floor-cloth, and carriages, especially beautiful sledges or sleighs. Montreal is the centre of management of the Grand Trunk Railway, which connects the railways of Canada with those of the United States, crossing the St. Lawrence at Montreal by the Victoria Bridge, 9184 feet in length, having twenty-four spans, each of 242 feet, and one, the central, which is 60 feet above the river, of 330 feet. This bridge was begun in 1854, and was crossed by the first train in December, 1859. The climate in summer is hot, reaching often 96° in the shade; and the winters are severe, the temperature ranging for weeks from zero to 10° below it. Montreal was permanently founded in 1642. It came into the hands of the English in 1760, when it was taken from the French by General Amherst. It was the seat of government of Lower Canada until 1849, in which year it was superseded by Quebec. In 1852 it suffered greatly from fire. Montreal returns three members to the Canadian House of Commons, and three also to the provincial legislature. The population consists of French Canadians, English, Scotch, Irish, and Americans, and in 1881 was 140,747.

MONTREAL, an island of Canada, in the river St. Lawrence, at the confluence of Ottawa River, 32 miles long, and 10½ broad, containing the city of Montreal. The surface is generally level (with the exception of Mount Royal), and the soil is for the most part fertile and well cultivated.

MONTROSE, a seaport town in Scotland, in the county of Forfar, at the mouth of the South Esk, 59 miles north-east of Edinburgh. It occupies a sandy peninsula inclosing a large expanse of water called the Basin, and has a very pleasing appearance. Its principal buildings are the various churches, a town-house with a spacious arcade below, several banks, militia barracks, an infirmary, museum, and academy. There are two principal libraries in the town, one having about 20,000 volumes. The river is crossed by a handsome suspension-bridge erected in 1829 and by a railway bridge. In the High Street there are statues of Sir Robert Peel and Joseph Hume. The principal employment is flax-spinning, employing about 3000 hands. The other industries include linen, iron-founding, starch, soap, tanning, brewing, and some shipbuilding. The harbour is one of the best on the east coast of Scotland. The depth at low water is 18 feet, and the wet-dock is capable of accommodating 6000 tons of shipping. Two lighthouses, one 45 feet high and the other 35 feet, were erected in 1818, on the north-east side of the river; and a new lighthouse 170 feet high, was erected in 1869, visible 18 miles off. In 1882 the number of vessels entered at Montrose with cargoes and in ballast was 681 of 94,039 tons burden; and the number cleared 680, of 93,664 tons. The chief imports are flax, hemp, coals, and herrings; exports—manufactured goods, grain, and cattle. Among the natives of the town or its immediate vicinity are Andrew Melville, James Graham, Marquis of Montrose, Sir Alexander Burnes the traveller, and Joseph Hume the politician. Montrose is one of the Montrose district of burghs, which includes Arbroath, Brechin, Forfar, and Bervie. Pop. in 1881, 14,975.

MONTROSE, James Graham, Marquis of, son of John, Earl of Montrose, was born in the town of that name in 1612, studied at St. Andrews, and afterwards made a prolonged stay on the Continent. On his return to Britain in 1636 he appeared at the court of Charles I., but the king seems to have slighted or overlooked him. In 1637, when the Scotch were organizing resistance against the Episcopacy forced upon them by Charles, Montrose joined the Covenanters. Shortly thereafter he was placed at the head of an army, and sent to crush the opposition to the popular cause which arose in and around Aberdeen. Again and again he occupied this city after hard fighting, and levied heavy imposts from the citizens. In July, 1639, he was one of the leaders who were appointed to confer with the king as to the abolition of prelacy, and Charles is credited with such fascination as to have converted the covenanting rebel into a zealous royalist. Montrose was created a marquis and made commander of the royal forces in Scotland. With an army partly composed of Irish and Highlanders he gained in rapid succession the battles of Tippermuir and Bridge of Dee (1644), Inverlochy, Auldearn, Alford, and Kilsyth (1645). Deserted by his Highlanders, however, he was attacked when at the head of a small party by Leslie's cavalry, was easily defeated, and compelled to take refuge abroad. In March, 1650, he returned, landing in Orkney with a small body of followers. He failed, however, in raising an army, and a month later was surprised and captured in Ross-shire, and was conveyed to Edinburgh, where he was hanged and quartered (21st May, 1650).

MONTSERRAT, or Monserrat (from its serrate or saw-like peaks), a mountain in Spain, in the province of Catalonia, 24 miles south-west of Barcelona. It is famous for its ancient Benedictine monastery, which was pillaged and partly destroyed in 1811 by the French. The monastery was composed, in part, of thirteen hermitages, accessible only by steps hewn out of the steep rock. It is said to have been founded by Sifredo el Vellaso, count of Barcelona, on the spot where a miracle-working image of

the Virgin Mary was found in the ninth century. It was enlarged and richly endowed by Philip II. Learned Benedictines had established themselves here as early as 976; and they and their successors formed a large library, which was destroyed when the monastery was pillaged by the French on the occasion above mentioned. After the restoration of Ferdinand VII. the rebuilding of the monastery was begun, but was stopped again when the monks were expelled by the Carlists in 1827. The monastery has fallen more and more into decay since the abolition of the order to which it belonged. It was while living in this monastery that Ignatius of Loyola conceived the idea of founding the order of Jesuits.

MONTSERRAT, or MONSERRAT, one of the British West Indies, belonging to the Leeward group, almost at the same distance (about 30 miles) from the islands of Nevis, Antigua, and Guadeloupe. It is 30,000 acres in extent, nearly two-thirds of which is mountainous and barren. The climate is on the whole healthful. The principal exports are sugar, rum, molasses, tamarinds, and lime-juice; and the principal imports, sheep, pigs, goats, horses, and firewood. In 1882 the total imports amounted in value to £28,780; and the total exports to £38,120. In the same year the gross amount of public revenue was £5692, the expenditure being £5834; there was no public debt. The government of the island is vested in the governor-in-chief of the Leeward Islands, who is represented by a president, assisted by a council and house of assembly. Plymouth, the capital, is on the south-west side of the island. The island was discovered by Columbus, and was colonized by the British in 1632. It has since been twice in the hands of the French, but from the year 1783 it has been uninterruptedly possessed by the British. Pop. (1881), 10,083, of whom not more than 200 are whites.

MONUMENT, in its widest sense, includes everything by which the memory of a person, period, or event is perpetuated. Monuments of antiquity include writings as well as the productions of the fine and useful arts; for Homer's poems are equally a monument of his time as the Pantheon or the domestic utensils found amongst the ruins of Pompeii. These monuments are of the greatest interest, leading us back into former ages, and presenting the manners, customs, and institutions of the people. Some are valuable only in their character of memorials, that is, as preserving the memory of certain persons or events; others have an intrinsic value as works of the fine arts. (See ANTIQUITY, ANTIQUE, &c.) The productions of sculpture and architecture, intended to transmit to posterity the memory of remarkable individuals or events, are most generally understood by the term monuments of antiquity. Such as ornament public places, gardens, &c., are chiefly in commemoration of great events. Among the monuments in honour of individuals are tombs and sepulchral edifices or columns. In all ages and with every nation we find this description of monument, from the first rude attempts of art to its greatest perfection. The most ancient known to us are the obelisks and pyramids of Egypt and the palaces and sculptures of Assyria. These monuments command our awe by their grandeur and simplicity, in which they are, perhaps, superior to similar works of Grecian art, though the latter excel them in beauty. Hardly any country offered so great a number of monuments as Greece, where they were erected in honour of the victors in battle, and in the solemn games, and of other distinguished men, but were often also thrown away on the undeserving. The warrior had statues and trophies; the victor in the games had statues and pillars. On the Isthmus of Corinth, near the temple of Neptune, were statues of the victors in the Isthmian games: in the holy grove of Altis, near Olympia, were those of the victors in the Olympic games. There were also many trophies. Buildings were frequently erected in commemoration of distinguished persons or events, which differed greatly in form and splendour. Thus, in Athens, the choragic monuments were erected in honour of those who had received the prizes as *choragi* in the theatrical and musical games. In these games it was customary for each of the ten guilds of Athens to select one *choragus*, who, at his own expense, undertook the regulation and superintendence of the games. Each endeavoured to surpass the other; the conqueror received a tripod of brass as the prize, which was usually the work of a great artist, and was regarded as an honour to his family. This prize was publicly placed on a small edifice or a single pillar, on which the name of the *choragus* and the date of the games were inscribed. A particular street in Athens was appropriated to these monuments, called the street of *tripods*. Some of these have been preserved to our time. The most splendid of all, and the most ornamented, is the choragic monument of Lysicrates, usually called the *Lantern of Demosthenes;* next to this the monument of Thrasyllus and Thrasycles, and some pillars. The Romans, who contended with the Greeks in the arts, were equally successful in monuments, of which one species is entirely theirs—the triumphal arch. (See TRIUMPHAL ARCH.) The earliest tombs in Greece and Rome were either erected on the spot where the ashes of the deceased were deposited, or in some other place chosen at pleasure. These latter were termed *cenotaphs*. Both kinds were found in the cities or their vicinity, and scattered along the roads, which they ornamented. The rude stone was by degrees transformed into a noble pillar; subsequently, on a foundation of stone, two small pillars were erected, covered with a pediment, and the intermediate space was destined for the images of the deceased, inscriptions, and bass-reliefs. Small buildings in the form of temples followed, and these, in time, increased in magnificence. The greatest monument of this description was the (so-called) *Mausoleum* (see ARTEMISIA), after which splendid sepulchres are still called *mausoleums*. Modern Europe presents monuments of both kinds.

MONZA, a town in Italy, Lombardy, in the province of Milan, and 9 miles N.N.E. of the city of Milan, and on the Lambro, which divides it into two parts, and is here crossed by three bridges. The town is of great antiquity, and has a quiet, venerable air. The most remarkable edifice is the cathedral of St. John the Baptist, originally founded at the end of the sixth century by the celebrated Lombard queen Theodelinde, but subsequently renovated and enlarged. It contains the ancient iron crown of Lombardy, restored to the Italians by Austria in October, 1866, as well as various other relics and some valuable art treasures. There is also an old imperial palace surrounded by a large and well-laid-out park. There are manufactures of silk, hats, leather, bricks, tiles, and sausages, for which the town has long been famous. Pop. on the 31st of December, 1881, 17,077.

MOODKEE. See MUDKI.

MOOLTAN. See MULTAN.

MOON, of the secondary planets that which revolves about the earth; she moves round the earth in an elliptic (nearly circular) orbit, inclined 5 degrees, 8 minutes, 48 seconds, to the ecliptic, in 27 days, 7 hours, 43 minutes, 11·461 seconds, a period of time which is called a sidereal month, at a mean distance of 238,833 miles, her greatest and least distances being 251,947 and 225,719 miles; for every revolution in her orbit she rotates once on her axis, so that

the same half of her surface is always presented to terrestrial observers; her libration (which see) is an apparent oscillatory motion which causes parts near the edge to appear and disappear, and enables us to examine about four-sevenths of her surface instead of merely one-half; her motion has perturbations of a most complex kind (see LUNAR THEORY); but it may now be said that they are understood by astronomers; her average eastward angular velocity in the heavens, as well as her average angular velocity of axial rotation, is 13° 10′ 35″ per day; if her orbit were in the plane of the ecliptic she would move in the apparent path of the sun among the fixed stars and lunar and solar eclipses would occur every month; as her orbit has the inclination given above, her meridian altitude has a range of 57°, and she occults in the course of time every star within 5° 24′ 30″ of the ecliptic; as seen from the earth her apparent diameter varies during the month, but it never differs much from that of the sun, which is about half a degree; she is not perceptibly flattened at the poles, both her polar and equatorial diameters being 2159 miles; her mean density is about half that of the earth; her mass is about $\frac{1}{77}$ that of the earth; the gravitating force which, at her surface, she exerts on the mass of 1 lb. avoirdupois is less than the terrestrial weight of 3 oz. An 'eclipse' of the moon occurs when she passes into the earth's shadow; when she prevents the sun from being seen there is an eclipse of the sun. (See ECLIPSE.) At a certain period of the moon's revolution she is invisible; the part of her luminous half surface which afterwards comes into view has at first the form of a sickle, then it increases in breadth, becoming semicircular and afterwards circular; it now decreases in breadth and assumes the semicircular and sickle forms before it again disappears. It is easy by a drawing (neglecting for simplicity the inclination of the orbit) to show how these 'phases' of the moon depend on her position with regard to the earth and sun. (See Pl. XII.–XIII.) When the moon is between the sun and the earth (that is, when the sun and moon are 'in conjunction') she presents her dark side to us, and in this invisible state is called 'the new moon.' She now moves to the east of the sun, and a small part of her luminous surface becomes visible. Less than four days after the time of new moon she is 45° from the sun, we now see a little of the illuminated portion, but she is still so nearly in a line with the sun that we only see a sort of crescent of light for a short time after sunset, this is the 'crescent moon.' She is now more and more in the east every evening at sunset, and the crescent gets broader and broader until between seven and eight days after new moon, when lines drawn from the earth to the moon, and from the moon to the sun, are at right angles, and when the moon is somewhat south at sunset she is said to be in her 'first quarter,' and exhibits a semicircle of light. As she moves more and more to the east of the sun the luminous portion becomes broader; she is 'gibbous' when 135° from the sun, and 'full' when 180°, that is, when the earth is between her and the sun, so that all the illuminated part of her surface becomes visible, and she rises at sunset to shine during the whole night. From new to full she 'waxes' or increases in size; she then begins to 'wane' or decrease in size, until she has gained a whole revolution on the sun. When she is in her 'last quarter,' and is about 90° to the west of the sun (270° to the east), she again exhibits a semicircle of light and rises at midnight. We now see less and less every night of her luminous surface, which again takes the sickle shape, and disappears when she again comes into conjunction with the sun. When new and full she is said to be in her 'syzygies;' her appearances at the different quarters are called 'changes.' In the phases just before and after new moon we sometimes see a faint illumination of the part not directly lighted up by the sun; this is called the 'earth shine,' and is due to reflection of light received from the earth; irradiation (which see) causes the faintly illuminated portion to appear to belong to a smaller sphere than the rest, so that 'the old moon is seen in the new moon's arms.' As each portion of the moon's surface is in sunlight or shadow for a fortnight at a time, and as no atmosphere has been observed, it is conjectured that some portions of her surface must be subjected to extremes of heat and cold, of which we can scarcely form an idea. To an observer on the moon the earth would appear to have a diameter four times that of the sun, it would be almost immovable in the heavens, changing its position only by the amount due to libration; it would exhibit phases. Of course that half of the moon which is never seen from the earth never receives any terrestrial light. If the moon has an atmosphere it must be very rare, as stars when occulted seem to disappear and re-appear instantaneously at the limbs; and besides, no clouds have ever been observed. Mr. Huggins finds that the spectrum of a star disappears instantaneously: an atmosphere would cause the spectrum to disappear gradually, beginning at the red end. No signs of organic life have been discovered on the moon; it is possible that the portion of her surface which is never presented to our view may be under more favourable conditions for supporting animal and vegetable life than the part which we see. It has been supposed that the centre of mass of the moon is much further away from us than her centre of figure, and that the portion of surface nearest us is really a region elevated far above her atmospheric sea, which is therefore nearly all gathered on the remote side. As a smaller body the moon has cooled from an incandescent state much more rapidly than the earth, and it is probable that parts in shadow are at a very low temperature; but if she has a dense atmosphere on the side remote from us, it may possibly form a covering capable of preventing the excessive variations of temperature to which the visible side must be subjected. It is supposed that the friction caused by tides due to the earth's attraction diminished the velocity of axial rotation until it became nearly equal to the monthly rotation round the earth; in such a case if the moon's axis of least moment were pointed towards the earth it may be shown that it would continue to point nearly towards the earth, and the peculiar phenomenon of a monthly axial rotation would be produced.

Galileo discovered mountains and valleys on the moon's surface. After new moon it is very interesting to observe the jagged shadows cast by the lunar peaks and mountain ridges on the surrounding plains; at any time between new and full moon the edge of the visible portion has a disconnected appearance, caused by surface inequalities; detached points of light, indicating elevated regions, start up in advance of the general illumination, and disappear some time after the surrounding regions have become invisible. The lunar mountains are mostly called after eminent scientific men. The most curious telescopic objects are the 'crater mountains;' they are certainly of volcanic origin; they consist of a circular basin with a conical elevation rising abruptly from the centre; the crater is often strewed over with large blocks, and the exterior part of its containing wall has deep radiating gulleys. Very few signs of lava-streams from the craters have been observed. Many astronomers have remarked apparent changes in some of these crater mountains, but the best authorities say

that the moon's surface is not liable to change of any sort. The craters are often 8 to 10 miles in diameter; when much larger than this they are called 'walled plains.' The 'gray plains' of the moon are often called 'seas,' but they undoubtedly contain no water; they are usually darker than the elevated surrounding regions. The heights of many lunar mountains have been measured by means of their shadows; the average height of some measured by Schröter is 5 English miles, so that they are immensely larger than terrestrial mountains in comparison with the sizes of their respective globes. They are sometimes detached as precipitous peaks, but they more generally form vast continuous ranges, sometimes flattened into plateaus, intersected by ravines, or rough with crowds of hillocks. Very peculiar 'ridges' of inconsiderable height extend for great lengths, connecting distant mountain ranges or craters; they seem to indicate tremendous upheavals of large tracts.

Of the 'clefts' or 'rilles' Mr. Webb says (in his Celestial Objects for Common Telescopes—a treatise in which the appearances presented by the lunar surface are fully described), 'These most singular furrows pass chiefly through levels, intersect craters (proving a more recent date), reappear beyond obstructing mountains, as though carried through by a tunnel, and commence and terminate with little reference to any conspicuous feature of the neighbourhood. The idea of artificial formation is negatived by their magnitude; they have been more probably referred to cracks in a shrinking surface. The observations of Kunowski, confirmed by Mädler at Dorpat, seem in some instances to point to a less intelligible origin in rows of minute contiguous craters.' On the visible surface of the moon there are also 'valleys' of various sizes, and 'faults,' or closed cracks, sometimes of considerable length. For the influence of the moon in producing tides see TIDES.

Age of the Moon is the number of days since last new moon. It is found by the following rule: To the epact (which see) add the number and day of the month; if this number is less than thirty it is the answer; if it exceed thirty the difference between it and thirty is the answer.

If the moon moved in the celestial equator the difference between her times of rising above the horizon on successive days would be nearly always the same; as she really moves nearly in the ecliptic her path sometimes makes a greater angle and sometimes a less angle with our horizon than the equator; every month, when she is in the sign Aries, her path makes a small angle with our horizon, and the time between two successive risings is less than if she moved along the equator; every year, within a fortnight of September 23d, she is in the sign Aries when 'full,' hence at this time every year the full moon rises at nearly the same time for several successive nights, and is called 'the harvest moon.' As the moon when full is always nearly opposite to the sun in the ecliptic her altitude at midnight is greatest at the time of year when the sun's altitude at noon is least, and *vice versâ;* hence in winter there is more moonlight than in summer, not only because the nights are longer, but because the winter moon, like the summer sun, is best situated for lighting up the northern hemisphere.

MOON, MOUNTAINS OF THE, the name given, on the authority of Ptolemy, who thus designates the range in which he places the sources of the Nile, to a chain of mountains supposed to extend across the whole African continent at its broadest part, from Cape Guardafui on the Indian Ocean to the Bight of Benin on the Atlantic. From the researches of modern travellers, however, it would appear that in reality no such range exists, though there are numerous different mountain systems in that extensive region. The only mountains, so far as is known, that can be looked upon as representing the ancient Mountains of the Moon lie between the east coast of Africa and the region of the great lakes. The loftiest of these are Mount Kilimanjaro, which is estimated to be 22,300 feet high, and Mount Kenia, which has an estimated elevation of 12,000 or 13,000 feet.

MOOR, To, to confine or secure a ship in a particular station by chains or cables, which are either fastened to the adjacent shore or to anchors in the bottom. A ship is never said to be moored when she rides by a single anchor.

MOORE, JOHN, a physician, distinguished as a cultivator of polite literature, was the son of an Episcopal divine, and born in 1729 or 1730 at Stirling. He became a student at the University of Glasgow, and having obtained a knowledge of medicine and surgery he went to the Netherlands in 1747, and served as a mate in the military hospitals. Peace taking place he became household surgeon to the British ambassador at Paris; and afterwards returning to Scotland he practised as a surgeon, and after taking the degree of M.D. as a physician, till 1772. In that year he was engaged by the Duchess of Argyle as medical attendant to her son (the ninth Duke of Hamilton), who was in a delicate state of health, and whom he accompanied on a tour on the Continent, which lasted more than five years. In 1778 he returned to London, and in the following year published A View of Society and Manners in France, Switzerland, and Germany (two vols. 8vo), which passed through numerous editions, and has been translated into several foreign languages. In 1781 appeared his View of Society and Manners in Italy, two vols.; and in 1785 a volume entitled Medical Sketches. The next production of his pen was Zeluco, a novel, containing interesting delineations of Italian character and manners. In 1795 he published A View of the Causes and Progress of the French Revolution, two vols. 8vo, describing scenes which he had witnessed during a residence at Paris. He also published two other novels, which were not, however, so successful as his first. Dr. Moore died at Richmond, in Surrey, in February, 1802.

MOORE, SIR JOHN, a distinguished military commander, was a son of Dr. Moore, the subject of the preceding article, and born at Glasgow on the 13th of November, 1761. Being destined for the military profession he was educated chiefly on the Continent; and whilst his father was abroad with the Duke of Hamilton the interest of that nobleman procured him admission to the service in the capacity of ensign to the 51st Regiment of foot. He served first at Minorca and afterwards in the American war, and gradually rose in rank till in 1795 he was sent as brigadier-general to the West Indies. At Barbadoes, in consequence of his appointment, he met Sir Ralph Abercrombie, commander of the expedition destined to act against St. Lucia; and in this hazardous service, of which an important department was assigned to General Moore, he acquitted himself with that steadiness and gallantry which excited the warm applause of his superior officer. The conqueror of St. Lucia, who had already designated General Moore as 'the admiration of the whole army,' committed to him the prosecution of his enterprise, together with the government of the island. Two successive attacks of the yellow fever soon forced General Moore to leave the West Indies. He subsequently served with distinction under Sir Ralph Abercrombie in Ireland during the rebellion of 1798, in Holland in 1799, and in Egypt in 1801. On his return from Egypt, where he had been severely wounded in the battle which cost Sir Ralph Abercrombie his life, his

merits were rewarded by an order of knighthood; and public opinion seemed to point him out as a fit person for conducting any military operation in which the country might require his services. After a few years of repose General Moore (1808) was called to take upon him the command of an armament which the British government had prepared in aid of the Spanish patriots, now engaged in hostilities with Napoleon. After an advance to Salamanca, in which he was chagrined by every species of disappointment, cramped by restrictions, perplexed by misinformation, and after a fruitless attempt to penetrate into Portugal, General Moore commenced a retreat to the coast, conducted it successfully in the face of an enemy greatly superior, and by his masterly dispositions at Corunna repelled the formidable attack, in which a cannon-ball deprived him of life, though not till his last moments were consoled by intelligence that victory had secured a safe embarkation for his troops. He died with the equanimity which became him, on the 16th of January, 1809. His death excited a great sensation throughout the country. The House of Commons ordered a monument to be erected for him in St. Paul's Cathedral, and his native city, Glasgow, also erected one to his memory.

MOORE, THOMAS, the national poet of Ireland, was the son of a grocer in Dublin, and born there on 28th May, 1779. He was educated at Trinity College, Dublin, with the view of becoming a lawyer, and in 1800 proceeded to London and entered as a student at the Middle Temple. His time, however, was more devoted to cultivating the muses than the legal profession, and in 1800 a translation of the Odes of Anacreon appeared from his pen, and obtained great praise. Thus stimulated he produced in 1801 the Poetical Works of the late Thomas Little, a collection of licentious poems which his extreme youth could only excuse, and which he afterwards lived to regret. The warmth and spirit of these, notwithstanding, procured him many admirers, and the acquaintance of some of the most influential men of the day. Through the patronage of Lord Moira the office of collector at Bermuda was bestowed on him in 1803. He landed there in January, 1804, but found the occupation so unsuited to him that he quitted it after appointing a deputy to perform his duties, and in November of the same year, after a tour through the United States and British America, was back again in England. In 1806 he published his Odes and Epistles, a series of the same objectionable kind as Thomas Little's poems, and which, being deservedly castigated by Jeffrey in the Edinburgh Review, occasioned the memorable duel between him and the distinguished critic. The year following the duel Moore entered into an engagement with Power, the music publisher, to produce a series of adaptations to the national Irish airs, he furnishing the words and Sir John Stevenson supplying the music. This great undertaking, which extended over a number of years, and was only completed in 1834, is the work on which his reputation with posterity will mainly rest. A separate series of songs, under the title of National Airs, was published in 1815, and in the same year a collection of Sacred Songs. In 1811 was performed his opera entitled M. P., or the Blue Stocking, which was shelved after a run of a few nights. The Twopenny Post Bag, by Thomas Brown the Younger, a series of satires on the proceedings of the prince-regent and his ministers, appeared in 1812, and by their wit and playfulness attracted considerable attention. The same year he took up his residence at Mayfield Cottage near Ashbourne, Derbyshire, and here, in the wild country surrounding the Peak, his gorgeous romance of Lalla Rookh, was elaborated. Its production was the result of an agreement with Messrs. Longman, by which he was to receive 3000 guineas for a poem to form a quarto volume. It was given to the world in 1817, and its success fully justified the liberality of Moore's publishers. It has been translated into several languages, and in particular into that of Persia, in which country the fidelity of its oriental descriptions and scenes rendered it as popular as in the colder regions of the West. The year of the publication of Lalla Rookh Moore paid a visit to Paris in company with the poet Rogers, and the results of this journey appeared in a satirico-burlesque poem, The Fudge Family in Paris, in the form of a series of amusing letters supposed to be written by the different members of an excursion party to the Continent. Another trip abroad to France and Italy, in 1819, produced Rhymes on the Road and Fables of the Holy Alliance. About this time, however, he had become involved in serious embarrassments by the defalcations of his deputy in Bermuda, and he found himself suddenly called upon to make up a deficiency of £6000, ultimately reduced to about £1000. This last sum he contrived to clear off by his literary earnings, though his friends were urgent in pressing on him offers of pecuniary aid. In 1822 appeared his Loves of the Angels, a poem with an attractive title, founded on the legendary belief of the 'giants in the earth,' the contemporaries of Noah, having sprung from the union of angels with the 'daughters of men.' The Life of Sheridan was produced in 1825, and the Epicurean, a prose romance, in 1827. Next came the Life of Lord Byron, published by Murray in two vols. 4to in 1830. (See BYRON.) His remaining works include the poem of the Summer Fête; Memoirs of Lord Edward Fitzgerald; Travels of an Irish Gentleman in Search of a Religion; the History of Ireland, written for Lardner's Cyclopedia; and several others. From the year 1835 he enjoyed a pension from government of £300 a year, and a further annual grant of £100 was settled in 1850 on his wife. For nearly the last thirty years of his life he resided at the cottage of Sloperton, near Devizes, adjoining the seat of the Marquis of Lansdowne, and here he died on the 26th of February, 1852, having been for three years previously reduced by softening of the brain to a state of mental incapacity. A biography of him, in eight volumes, edited from his journal and correspondence, was published after his death by his friend Lord John Russell.

MOOR-FOWL. See GROUSE.

MOOR-HEN, or GALLINULE. See GALLINULE.

MOORISH ARCHITECTURE. See ARCHITECTURE.

MOORS, a class of the inhabitants of Western Africa, particularly of the states of Fez and Morocco. The Arabians call them *medainien* (mariners); they call themselves *Moslem* (the faithful), and are strict Mohammedans. The name which they bear is derived from that of the ancient inhabitants of Mauritania, although not they, but the Amazirgh, or Amazigh, a branch of the Berbers (which see), are the pure descendants of that race. The modern Moors are a mixed race, sprung from the union of the Arab conquerors of Mauritania with those of the ancient Moors who remained in the plains and towns, and did not, like the Amazigh, take refuge in the mountains. The conquest referred to took place in the seventh century. As the Arabians who overthrew the kingdom of the Visigoths in Spain in the beginning of the eighth century (711–713) came from Mauritania, they were also called Moors by Spanish writers, and the name has been generally adopted. While the greatest part of Europe was sunk in

barbarism learning and the arts flourished among the Arabians in Spain, where remarkable monuments of their labours are still seen; but the division of the country among different rulers, and their dissensions, so weakened the power of the Moors that they could no longer resist the incessant encroachments of the princes of the newly established Christian states in Spain, and were finally reduced to the possession of the Kingdom of Granada. Here they maintained an independent kingdom till near the end of the fifteenth century, when they were conquered by Ferdinand the Catholic, and brought under the government of Castile, afterwards of Spain. A part of the Moors went to Africa; most of them remained in Spain, where they were industrious, peaceful subjects, and adopted generally the external forms of Christianity. These last were called in Spain *Moriscos*. Philip II., in his ferocious zeal for Christianity, resolved upon their entire destruction. His oppressions and persecutions excited an insurrection of the Moriscos in Granada (1570), after the suppression of which above 100,000 of them were banished. Philip III., in the same spirit of fanaticism, completed their expulsion from the country (1609). Nearly a million of the Moriscos emigrated to Africa. As they were the most ingenious and industrious inhabitants of Spain they were a great loss to the country. Agriculture speedily fell into decay. This expulsion of the Moriscos is regarded as one of the leading causes of the decline of Spain. The History of the Reign of the Moors in Spain, by Jos. Ant. Conde, is drawn from Arabian manuscripts.

MOORSHEDABAD. See MURSHIDABAD.

MOOSE. See DEER.

MORA, a game known even among the ancients, and at present much in vogue in the south of Europe. It is played by two persons. Both present at the same time one hand, of which some fingers are extended, or all, or none. At the same moment each of the parties calls out a number. If the number pronounced by one of the players agrees with the total number of the fingers stretched out by both, he who pronounced it counts one, and lifts one finger of the unemployed hand. He who first succeeds in opening all the fingers of this hand wins the game. It is generally played to determine who is to pay for the wine, and the like. A person unacquainted with the game finds it difficult to conceive how it can be interesting; yet you see it played with the greatest animation everywhere in Italy. The phrase used in Latin to designate this game was *micare digitis*.

MORADABAD, a town in India, in Rohilkhand, in the North-west Provinces, 75 miles east of Meerut, on the Ramgunga. It was founded by the Rohilla Afghans, and has a church and an American mission, and a cantonment. Pop. (1881), 67,387.

MORAINE. See GLACIERS.

MORALES, LUIS DE, commonly called *el Divino*, from his having painted nothing but sacred subjects, was born at Badajos in 1509; died there 1586. Morales visited all the cities of Spain which contained any *chef d'œuvre*, and by this indiscriminate study of different masters acquired remarkable originality of manner. Having been invited by Philip II. to aid in decorating the Escurial Morales accepted the invitation, but so offended his sovereign by the ostentatious magnificence of his train that he was desired to return to his own province. In consequence of this disgrace he lost all the wealthy patrons, who had formerly paid him high prices for his works, and his circumstances thus became somewhat straitened. In 1581 he was visited by Philip, who granted him for the rest of his life a pension of 300 ducats. His works are scattered through Spain. He is praised for the correctness of his drawing, especially of the naked human figure, for the skill shown by him in the gradation of tints, and for his power of giving expression to resigned sorrow. The works of his son and some other imitators of himself of much inferior merit are often confounded with his.

MORALITY, a sort of allegorical play, so termed because it consisted of moral discourses in praise of virtue and condemnation of vice. It succeeded the Mysteries. The dialogues were carried on by such characters as Good Doctrine, Charity, Faith, Prudence, Discretion, Death, &c., whose discourses were of a serious cast; while the province of making merriment for the spectators descended from the Devil in the Mystery to the Vice or iniquity of the Morality, who usually personified some bad quality, and whose successor we find in the clown or fool of the regular English drama. Moralities were occasionally exhibited as late as the reign of Henry VIII., and after various modifications assumed the form of the Masque, which became a favourite entertainment at the court of Elizabeth and her successor. See DRAMA.

MORAL PHILOSOPHY. See ETHICS.

MORAT (German, *Murten*), a town in the Swiss canton of Freiburg, on the Lake of Morat (Murtensee), 16 miles west of Bern. It derives its celebrity from the battle fought here on the 22d of June, 1476, in which the Swiss Confederacy, aided by some allies from the Rhenish cities, totally defeated Charles the Bold, duke of Burgundy. The remains of the killed were thrown into a large pit, and covered with lime and earth. A large building was afterwards erected, in which the bones were collected, and which bore an inscription stating the occasion of its erection. This monument was destroyed by the French army in 1798, and a lime-tree, surrounded with a fence, planted in its place. In 1822 the Swiss Confederacy erected an obelisk on the spot as a national memorial of the battle.

MORATIN, LEANDRO FERNANDEZ, a Spanish writer of comedies, born at Madrid in 1760; died at Paris in 1828. He came into France in the train of the Count of Carbarrus in 1786, and was thus enabled to study the French theatre. After his return to his native country in 1789 he received a church living in the archbishopric of Burgos. At a later period he found a patron in Godoy, the Prince of Peace, through whose influence he had several benefices and a pension bestowed upon him, by which he was enabled to follow his own tastes. He had already produced the comedies El viejo y la niña (1790) and La comedia nueva (1792). He then, with the view of self-improvement, made pretty extensive travels in France, Germany, Switzerland, and Italy. After his return he produced in quick succession several other comedies—El baron, La mogigata, and El Sí de las niñas—which were all performed with great success. After the fall of the Prince of Peace (1808) he was obliged to flee, and he did not return to Madrid till the city was entered by the French. Having been compelled once more to flee when Madrid was evacuated by the French he fell into great distress, until in 1816 his former incomes were restored to him. Further persecutions obliged him to quit Spain again in 1817, and the rest of his life, except an interval of two years, was spent in France. A complete edition of his works was published by the Spanish Academy of History at Madrid in 1830–31. This edition contained a work of Moratin, till then unpublished, entitled Los origenes del teatro español, a work of great value for the literary history of his native country.

MORAVIA (German, *Mähren*), a province of the Austrian Empire, bounded north by Prussia, north-east by Galicia, east and south-east by Hungary, south by Hungary and Austria, and west by Bo-

hemia; area, 8584 square miles. Moravia Proper consists of a large basin, surrounded by mountains on the north, east, and west (on the north by the Sudetes, on the east by the Carpathians, and on the west by a low range of hills which gradually ascends towards the north until it unites with the Sudetes), and open only on the south, towards a central point, to which all its slopes converge and all its drainage is carried. Moravia has thus the advantage of being completely sheltered in the directions from which frosts and storms are most to be feared, and enjoying the full benefit of a southern exposure. Its climate, accordingly, is milder and more genial than that of most European countries under the same latitude. Moravia belongs wholly to the basin of the Danube, all the smaller streams falling into the March or Morava, which is itself a tributary of the Danube. The minerals are of considerable importance, and include gold, silver, lead, copper, iron, coal, graphite, alum, saltpetre, copperas, meerschaum and porcelain clay, and marble. The precious metals, however, have ceased to be worked, and even iron and coal are very much neglected. The soil is generally fertile, and all the ordinary cereal, leguminous, and root crops are raised in abundance. Flax of excellent quality is extensively grown in several districts, and fruit is so abundant that many parts of the country have the appearance of one great orchard; but the favourite culture is that of the vine, for which both the soil and exposure of the province seem admirably adapted. The pastures, in general excellent, occupy a large extent of surface. The rearing of cattle, nevertheless, gets comparatively little attention, and is not sufficient to meet the home demand. Sheep, on the other hand, are reared in abundance, and are of good quality. They have been much improved by judicious crossing with the merino, and furnish a wool to the excellence of which the woollen manufactures of the country owe no small portion of their prosperity. The horses, too, are of a strong, hardy, active breed, and are much used in the Austrian service for heavy cavalry. Manufactures have made great progress within the present century, and in all the great branches of industry—in iron and ironmongery, leather, linen, cotton, and woollen tissues, particularly the last—Moravia is inferior to none, and takes precedence of almost all, the provinces of the Austrian Empire. Other manufactures deserving of notice are silk, glass, paper, potash, and beet-root sugar. The trade in most of these articles is of considerable importance. About 70 per cent of the inhabitants are of Slavonian extraction, and 26 per cent Germans, the latter found mostly in the towns and on the borders. The language chiefly spoken and called Moravian is merely a Slavic dialect; German, however, is generally understood by all classes. The religion professed is Roman Catholic. Elementary education is generally diffused, and numerous gymnasia furnish education of a very superior order. Professional studies are successfully prosecuted at the University of Olmütz. Moravia was anciently inhabited by the Marcomanni and Quadi, afterwards by the Rugii, and still later by the Longobardi. It was finally occupied by a colony of Slaves, who took the name of Moravians from the river Morava. In 1029 Moravia was united to the Kingdom of Bohemia, with which it had the same constitution, administration, and laws. In 1197 it was erected into a margraviate, with a separate court and a separate administration. With Bohemia it passed to the house of Austria in 1527. Moravia sends thirty-six members to the Austrian house of deputies. (See AUSTRIA —Constitution.) Pop. in 1880, 2,153,407.

MORAVIANS, or HERRNHUTERS. See UNITED BRETHREN and BOHEMIAN BRETHREN.

MORAY FIRTH, the largest and most northern gulf on the coast of Scotland, on the east coast, containing at its widest extent the sea between Duncansby Head in Caithness-shire and Kinnaird Head in Aberdeenshire; the outer firth comprehends the Dornoch Firth and the inner Moray Firth, the entrance to which lies between Tarbetness in Cromarty and Burghead in Elginshire, and extends into Cromarty Firth and Beauly Firth and Loch. The opening of the outer firth to the North Sea is 80 miles in extent. It has Caithness and Sutherland shires to the north-west, and Elgin, Banff, and Aberdeen shires to the south. The inner firth lies between Ross and Cromarty shires on the north-west, and Inverness, Nairn, and Elgin shires on the south. With the exception of the firths already mentioned the coast, though gently undulating, is not much indented. Sinclair Bay, near Duncansby Head, Burghead Bay and Findhorn Loch in Elginshire, are among the most considerable indentations. The Spey and the Deveron are the most considerable rivers which enter the firth.

MORAYSHIRE. See ELGINSHIRE.

MORBIHAN, a department of France, bounded north by Côtes-du-Nord, west by Finistère, south by the Bay of Biscay, south-east by Loire-Inférieure, and east by Ille-et-Vilaine; area, 2624 square miles, of which 950 are arable and 1130 *landes*. The coast is lined by several islands, and is deeply indented; the interior is much broken, and in its higher districts presents many heathy wastes, while many other portions are fertile enough as to leave a considerable surplus of corn for export. The ordinary fruits also are abundant, and a good deal of cider is made. The principal mineral is iron, which supplies several blast-furnaces. The manufacturing industry is inconsiderable. The trade, favoured by the harbours on the coast and by canals, is considerable. The county has four arrondissements, thirty-seven cantons, and 249 communes. The chief town is Vannes, the seat of a bishopric. Pop. (1881), 521,614.

MORDANTS. Dyes may be divided into two classes; those included in the first class have the property of fixing themselves directly to the fibres of cotton or other goods, while those of the second class are only deposited in the pores of the cloth through the agency of another substance. This other substance, this go-between, is called a mordant. Mordants for the most part consist of mineral salts, which undergo partial decomposition without much difficulty. Salts of aluminium, especially the acetate and sulphate; ferrous acetate, and tin salts, are the principal mineral mordants; while various oils, tannin, albumen, casein, &c., are the leading vegetable mordants.

The salts of aluminium, iron, and tin, which have been named, are none of them very stable; the basic constituents are more or less ready to separate from the acid, and at the same time to absorb oxygen, and so form insoluble compounds. When, therefore, a piece of calico is saturated with one of these solutions and hung up for some time, or passed through heated rollers, the salt enters into the little hollow tubes of the cotton, and is there decomposed, the aluminium, iron, or tin being deposited as an oxygenated compound, while the acid—acetic or hydrochloric—is driven off. And not only have these salts this property of being easily decomposed within the pores of the cloth, but the oxygenated compounds thus produced are also able to combine with and remove from solution the colouring matter of many dyeing materials. Thus a solution of aluminium acetate, if mixed with a decoction of logwood and allowed to remain for some time, will entirely remove the colouring matter from the solution. If, therefore, the

mordanted cloth be dipped into a hot solution of the dye-stuff, the mordant will combine with this substance, and hold it within the pores of the cloth, forming with it and with the cloth an insoluble substance, which cannot be removed by subsequent washing. It is evident that, generally speaking, those salts will be preferred as mordants which on decomposition yield colourless oxygen compounds, as these compounds will not mask the shade of the dye-stuff itself. Sometimes, however, such salts as ferrous acetate are used, whereby a dark-coloured precipitate is produced, which in combination with the colouring matter of the dye gives rise to the formation of exceedingly dark colours. See DYEING.

MORDAUNT, CHARLES. See PETERBOROUGH (EARL OF).

MORDVINS, a race of people inhabiting European Russia, and belonging to the Bulgaric or Volgaic group of the Finnish family of peoples. They are found chiefly in the governments of Penza, Simbirsk, Saratov, Samara, Nishegorod, and Tambov. A small number of them live also in the governments of Kasan, Orenburg, Tauris, and Astrakhan. Their chief sources of livelihood are cattle-rearing, hunting, fishing, and bee-keeping. Since the time of the Empress Anna they have been gradually converted to Christianity, and they now retain little of their former manners. They speak a language of their own, of which a grammar has been prepared by Von der Gabelentz and Wiedemann (St. Petersburg, 1865). Their numbers are estimated at 480,000.

MORE, HANNAH, a highly popular writer on moral and religious subjects, was born at Clifton, near Bristol, about 1745. Her talents early made her acquainted with Johnson, Burke, Garrick, and other literary men of the period, and she acquired considerable success as a dramatic writer. The Inflexible Captive, Percy, and the Fatal Captive, were successfully brought out through the patronage of Garrick and her other friends. After the production of the last in 1779 she abandoned the stage from religious motives, and devoted herself to the composition of works having a moral and religious tendency, the diffusion of tracts, and other philanthropic labours. In this new course her very superior talents commanded an extraordinary measure of success. A series of tracts called the Cheap Repository, which she commenced at Bath in 1795, is said during the first year to have had a circulation of between 1,000,000 and 2,000,000 copies. The profits of her works during her lifetime are said to have exceeded £30,000, and she bequeathed more than £10,000 to charitable purposes. She left Bath about 1800 for Barley Wood, near Wrington, Somerset; and in 1819, after the death of her sisters, she removed to Clifton, where she died in 1833. Her Strictures on the Modern System of Female Education appeared in 1799; Hints towards Forming the Character of a Young Princess in 1805; Coelebs in Search of a Wife in 1809 (which passed through at least six editions in less than a year); Practical Piety in 1811; Christian Morals in 1812; Essay on the Character and Writings of St. Paul in 1815; and Moral Sketches of the Prevailing Opinions and Manners, Foreign and Domestic, with Reflections on Prayer. The collection of her works comprises eleven volumes 8vo. The Life of Hannah More, with Notices of Her Sisters, by the Rev. Henry Thompson, was published in London in 1838.

MORE, HENRY, D.D., a celebrated divine and philosopher, was born in 1614. After the usual course at Eton he entered Christ College, Cambridge, in 1631. In 1639 he graduated M.A., and in the following year published his Psycho-Zoia, or the First Part of the Song of the Soul, a blending of Christian and Platonic doctrines. In 1675 he accepted a prebend in the church of Gloucester, which it is supposed he took only to resign it to his friend Dr. Fowler. He also gave up his rectory of Ingoldsby, in Lincolnshire, the perpetual advowson of which had been purchased for him by his father, and would never afterwards accept of preferment. In 1661 he became a fellow of the Royal Society, and for twenty years after the Restoration his writings are said to have sold better than any others of their day. He died in September, 1687. His writings are characterized by the belief that Plato had received through Pythagoras a knowledge of Hebrew theology and was also favoured directly with supernatural communications. The most admired are his Enchiridion Ethicum and Divine Dialogues concerning the Attributes and Providence of God. The Life of Henry More was written by R. Ward (London, 1710).

MORE, SIR THOMAS, a celebrated Chancellor of England, was the only son of Sir John More, one of the judges of the Court of King's-bench, and was born in London, in 1480. He received his early education from a schoolmaster of great reputation in Threadneedle Street, and was afterwards placed in the family of Cardinal Morton, archbishop of Canterbury, and chancellor, who prophesied his future eminence. In 1497 he went to Canterbury College, now Christ Church, Oxford, and in 1499 became a student in Lincoln's Inn. At the age of twenty-one he obtained a seat in Parliament, and distinguished himself with so much spirit in opposition to a subsidy demanded by Henry VII. that the exasperated and avaricious monarch in revenge contrived a quarrel with his father, whom he imprisoned until he had exacted an arbitrary fine. After being admitted to the bar he was appointed law-reader of Furnival's Inn, applied assiduously to the practice of law, and enjoyed great reputation as a pleader. In 1515 he accompanied the commissioners sent to renew the alliance between Henry VIII. and Charles, then archduke of Austria, and showed so much ability, that the king was desirous of engaging him in his particular service. In 1518 he published his celebrated political romance of Utopia, which engaged him in a correspondence with Erasmus, with whom he had previously contracted an intimacy while in England; as well as with several other eminent men of letters. Cardinal Wolsey pressed him to receive a pension, which he refused as inconsistent with his official duties; but after a while he was induced to accept the place of master of requests. He was shortly after knighted, and taken into the privy council; and the king, becoming delighted with his conversation, he was received into the highest degree of familiarity. In 1520 he was appointed treasurer of the exchequer, and in 1523, at the instance of Wolsey, he was elected speaker of the House of Commons, in which capacity, having done much to frustrate an oppressive subsidy, he highly exasperated the cardinal. If he gave any personal offence to the court by this conduct it was not of long duration, as in 1527 he was joined with Wolsey in a mission to France, and on his return was made Chancellor of the Duchy of Lancaster. In 1530 he succeeded the disgraced cardinal as lord high-chancellor, which office he filled for three years with scrupulous integrity. Unable to acquiesce in the king's wishes respecting his divorce from Catharine of Arragon, he obtained permission to resign the seals. The affront rankled in the vindictive mind of Henry, which was still further inflamed by his refusal to attend the coronation of Anne Boleyn. An attempt was made to implicate him in the practices of Elizabeth Barton, which altogether failed; and he also perfectly

cleared himself of another singular charge, which was that of inducing the king to publish the book against Luther, in which the Pope's authority was held forth—a doctrine that was now found inconsistent with the intended attack on the Roman see. At length the oath of supremacy being required by act of Parliament Sir Thomas More was cited before the council to take it; and in spite of all the sophistry of Cranmer and others to induce him to compliance, he nobly persisted in a refusal to act in opposition to the dictates of his conscience, and was consequently committed to the Tower, and indicted for treason. After an imprisonment of twelve months, during which time he resisted all attempts, both public and private, to induce him to retract, he was brought to trial, and after an eloquent defence condemned and sentenced to be hanged and quartered. He received this barbarous sentence with his usual composure, which was disturbed only by the circumstance of a singularly affecting interview with his favourite daughter, Mrs. Roper, on his return to the Tower. The king changed the sentence from hanging and quartering to beheading, which act of grace he received with his usual vein of humour, and also acquiesced in the tyrannical mandate 'that he should not use many words at the scaffold.' His execution took place July 6, 1535, when he deported himself with a degree of good humour which in another sort of man might have been termed levity. His learning was various and extensive, his wit abundant, and his elocution ready and agreeable. Except his intolerance towards those whom he considered heretics, indeed, the qualities of his mind were most happily blended and tempered. His English works were published collectively, by order of Queen Mary, in 1557, and his Latin in 1567, at Basel. His Utopia has been translated by Bishop Burnet and Dr. Warner. See the Life of More by Sir James Mackintosh, written for Lardner's Cabinet Cyclopædia. By his first wife Sir Thomas More had three daughters and one son.—MARGARET, his eldest and favourite daughter, married William Roper, Esq., of Eltham, in Kent, who wrote the life of his father-in-law, published in 1716. She was mistress of the Greek and Latin languages, and composed with elegance both in English and Latin. Her reverence and affection for her father were unbounded. After his head had been exposed fourteen days on London Bridge she contrived to obtain it, and carefully preserved it; and when she died it was, at her dying request, buried in her arms.

MOREA. See GREECE (MODERN).

MOREAU, JEAN VICTOR, one of the oldest and most celebrated generals of the French Republic, was born at Morlaix, in Bretagne, in 1763. Bred to the law he early displayed a predilection for the military profession, and when the revolution broke out he had already acquired considerable reputation. In 1789 he became commander of the first battalion of volunteers, raised in the department of Morbihan, at the head of which he joined the army of the north. He favoured the party of the Gironde, the fall of which much affected him, and it was with great repugnance that he accepted the constitution of 1793. In the meantime he distinguished himself at the head of his battalion. In 1793 he was made general of brigade, and in 1794 general of division, and was intrusted with a separate force to act in Maritime Flanders, where he took many towns. He also had a share in the memorable winter campaign of 1794, in which he commanded the right wing of Pichegru's army. He was named commander-in-chief of the army of the Rhine and Moselle (1796), destined to threaten Vienna simultaneously with the invasion of Italy by Bonaparte, and commenced that course of arduous operations which terminated in the celebrated retreat from the extremity of Germany to the French frontier, in the face of a superior army, by which his skill as a consummate strategist was so much exalted. A treasonable correspondence of Pichegru, his former commander, having fallen into the hands of Moreau, he gave it up, after having concealed it for some time, on the arrest of Pichegru. The tardiness of the surrender having roused suspicion he was compelled to retire, and continued for about eighteen months without employment. In 1799 he was sent to serve under and afterwards to replace Schérer in command of the army of Italy. He was soon after superseded by Joubert, but the latter being killed at Novi he again resumed the command, and being outnumbered managed another retreat with great skill. On quitting the command in Italy for that on the Rhine he returned to Paris, and on the return of Bonaparte from Egypt he at first cordially supported him, but a coldness and jealousy ensued, notwithstanding which the latter, as first consul, intrusted him with the command of the armies of the Danube and the Rhine (1800). The passage of these rivers, and a series of victories, ending with the decisive battle of Hohenlinden, induced the Austrians to ask for peace. On his return to Paris he contracted an alliance with a young lady of birth and fortune, whose ambition, with that of her connections, is supposed to have fomented the discontent which soon after induced him to retire to his estate at Grosbois. He was finally found guilty of participation in the conspiracy of Pichegru and Georges. He was at first condemned to two years' imprisonment, but exile being substituted he went first to Spain, and thence to the United States. Having purchased an estate near Morrisville, on the Delaware, he resided there some years in peace, until, listening to the invitation of the allies, and more especially of Russia, he embarked for Europe, and reaching Gottenburg, proceeded to Prague. Here he found the Emperors of Austria and Russia, with the King of Prussia, and was induced to aid in the direction of the allied armies against his own country. It was a fatal resolution to himself, for on the 27th of August, soon after his arrival, while conversing with the Emperor Alexander on horseback, in the battle before Dresden, a cannon-ball fractured his right knee and leg, and carried away the calf of the left leg, so as to render the amputation of both necessary. After lingering five days he expired, September 1, 1813. He was buried at St. Petersburg, and the Emperor of Russia made an ample provision for his widow, who also received the title of *maréchale* from Louis XVIII. The manners of Moreau were simple, and in his private character he was humane and generous, as well as brave.

MORECAMBE BAY, a spacious gulf on the north-west coast of England, between Furness and Walney Island on the north-west and the Lancashire coast on the south-east, and penetrating the coast of Westmoreland, where the Kent discharges itself into it by a broad estuary. It is very shallow, and consists of an alluvial and sandy flat, great part of which is fordable at low water. The idea of recovering the greater part of it from the sea has been repeatedly entertained, but only a small part has as yet been reclaimed.

MORELIA, or VALLADOLID, a town of Mexico, capital of Mechoacan, between two streams, in the valley of Olid, 6398 feet above sea-level. It enjoys a mild and salubrious climate, though snow occasionally falls in winter; is well built, has many handsome houses, several elegant churches, and a fine paseo and alameda. Pop. about 20,400.

MORESQUES, in painting. See ARABESQUES.

MORGAN, SYDNEY, LADY, an authoress of some reputation, though, perhaps, more distinguished in society for the brilliance of her conversation. From her reluctance to let her age be known the time of her birth is not ascertained; the dates given vary as much as from 1770 to 1786. Her father was an actor on the Dublin stage, of the name of MacOwen, afterwards changed to Owenson. She was a smart, lively child, and early attracted considerable attention by her musical and other accomplishments. Her first literary effort was a volume of poems published in 1797, followed by a collection of Irish songs, and two novels, entitled St. Clair, and the Novice of St. Dominick. In 1806 appeared her Wild Irish Girl, a novel which became immediately popular, passing through seven editions in two years, and secured for her a high position in fashionable and literary life. She had by this time removed from Dublin to London, and in 1811 was married to Sir Charles Morgan, an eminent physician, with whom she resided for a considerable period at different times in France and Italy. The result of her visit to these countries was two works on their social condition, both of which attracted considerable attention. Among the other writings of Lady Morgan are the novels of O'Donnell, Florence Macarthy, and the O'Briens and the O'Flahertys; the Life and Times of Salvator Rosa; Woman and her Master; and Passages from my Autobiography. She was predeceased by her husband, and had a pension of £300 a year bestowed on her by the government of Earl Grey. She died in Lowndes Square, London, on 13th April, 1859.

MORGANATIC MARRIAGE (from the Gothic word *morgjan*, to shorten, limit; also sometimes called in Germany a *left-handed marriage*) is one in which it is stipulated that the wife (who is inferior in birth to the husband) and her children shall not enjoy the privileges of his rank nor inherit his possessions. Frederick William III. of Prussia contracted an alliance of this kind with the Countess von Harrach. The common law of Germany permits such marriages only to the high nobility. They are often erroneously regarded as somewhat illegal, which is not the case, though serious objections can be raised against the principle.

MORGARTEN, BATTLE OF. The first battle fought by the Swiss Confederates for their independence. It was fought by the allied cantons of Schwyz, Uri, and Unterwalden against the Archduke Leopold of Austria. A body of allies was posted on the mountain of Morgarten, on the confines of Schwyz and Zug, commanding a pass close to Lake Ægeri. When Leopold's army entered the pass they rolled down stones upon them, and threw the cavalry into disorder. A body of the Swiss who occupied the pass then charged the Austrians, and completed their route. The battle was fought 15th November, 1315.

MORGHEN, RAPHAEL SANZIO, a celebrated engraver, was born according to some authorities at Portici, near Naples, according to others at Florence, between 1755 and 1761. He received his early instructions from his father, and was afterwards placed as a pupil under the celebrated Volpato, whom he assisted in engraving the famous pictures of Raphael, in the galleries of the Vatican. The print which represents the miracle of Bolsena is inscribed with his name. After having married the daughter of Volpato, he received from him a commission to execute engravings from four paintings in the Vatican. He settled in Florence about 1793. The reputation which he acquired by his labours on the Florentine Gallery induced the artists of Florence to recommend to the grand-duke to employ him in engraving Leonardo da Vinci's noble composition of the Last Supper, which is painted on the wall of the refectory in the Dominicans' convent at Milan. This picture is much dilapidated, and the drawing which was made from it for Morghen was by no means worthy of the original; so that though the engraver has given to the world an admirable print, he has failed in giving a correct idea of the style and merit of Leonardo. In 1803 he was chosen an associate of the French Institute; and in 1812 he was invited to Paris by Napoleon, who treated him with the most flattering kindness. Among the most remarkable of the other numerous works of Morghen, may be noticed the Transfiguration, from Raphael; a Magdalen, from Murillo; a Head of the Saviour, from Da Vinci; the Car of Aurora, from Guido; the Hours, from Poussin; the Prize of Diana, from Domenichino; the Monument of Clement XIII., from Canova; Theseus vanquishing the Minotaur; portraits of Dante, Petrarca, Ariosto, Tasso, &c. A complete list of his works, to the number of about 200, was published by Palmerini at Florence, in 1810. Raphael Morghen died at Florence in 1833.

MORGUE, LA, a place in Paris, behind Notre-Dame, where the bodies of unknown persons who have perished by accident, murder, or suicide are exposed, that they may be recognized by their friends. If not claimed after remaining three days they are buried. The clothes of the deceased are hung over the body, which is placed on a slab of black marble. The corpses may be publicly seen through a glass partition. The Morgue was rebuilt in 1864. It is open to the public from six in the morning in summer, and seven in winter, to eight in the evening in summer, and till dusk in winter.

MORIER, JAMES, novelist, was born in 1780. He accompanied Lord Elgin as private secretary on his embassy to Constantinople, made the campaign of Egypt in the suite of the grand-vizier, was taken prisoner by the French, and after his release became from 1810 to 1816 British envoy at the court of Persia. He died at Brighton in 1849. In 1812 he published a Journey through Persia, Armenia, and Asia Minor to Constantinople, in 1808–9; a Second Journey through Persia to Constantinople, 1810–16, was published in 1818; The Adventures of Hajji Baba of Ispahan appeared in 1824; The Adventures of Hajji Baba of Ispahan in England, in 1828; Zohrab the Hostage, in 1832; Ayesha the Maid of Kars, 1834; Abel Allnut, 1837; The Banished Swabian, a translation from the German, in 1838; Mirza, a romance, 1841; Martin Tourtond, 1849. Morier's fame rests on his novels, which contain admirable pictures of eastern life.

MORIN'S APPARATUS, a machine invented by General Morin to illustrate the laws of falling bodies. A vertical wooden cylinder covered with paper is made to rotate uniformly. In front of the cylinder a heavy body may be allowed to fall along smooth vertical guides, which do not retard its motion; the point of a pencil carried by the body is gently pressed against the paper by means of a spring. When the body is stationary the pencil marks a horizontal line on the moving paper; if the cylinder were stationary, the pencil in its vertical motion would make a vertical line on the paper; when the cylinder is in motion and the body is allowed to fall, the pencil marks a curved line on the paper which, when spread out flat, shows that this curve is one-half of a parabola. A well-known geometrical property of a parabola whose axis is vertical is, that the vertical distance of any point in the curve from the vertex is proportional to the square of its horizontal distance from the vertex. Hence in marking the paper the vertical distance travelled by the pencil in any time from rest is proportional to the square of the horizontal distance travelled by

the paper in the same time; so that as the cylinder rotates uniformly, the vertical distance fallen through by the body is proportional to the square of the time of falling; this is the well-known law of falling bodies. The rotation of the cylinder is caused by the falling of a weight, motion being transmitted by means of a cord, a horizontal drum, and a wheel and endless screw. The motion is regulated by means of a rotating vane.

MORION, a kind of open helmet without visor or beaver, somewhat resembling a hat, which was commonly worn by the arquebusiers and musketeers.

MORISCO. See MOORS.

MORISONIANS. See EVANGELICAL UNION.

MORLAIX, a town, France, in the department of Finistère, 34 miles north-east of Brest, on a small estuary formed by the junction of the Jarleau and Kerlent. Its site, in a narrow valley, through which the stream flows, leaving only room sufficient on either side for a single street, is very picturesque, and many of the houses have a quaint and antique appearance. The steep sides of the valley are occupied as gardens or clothed with wood. The principal buildings are the hôtel de ville, which is large and elegant, and two churches. The chief industrial establishment is a government tobacco factory, employing about 400 men and 700 women. Linen, paper, and iron are also manufactured to some extent; and the trade, chiefly in agricultural produce and live stock, is considerable. Pop. 15,346.

MORMONS, or the LATTER-DAY SAINTS, a so-called religious sect, founded by a person of the name of Joe Smith. This person, born in 1805 at Sharon, in Vermont, United States, of a family possessed of a bad character, and of which he subsequently acquired the reputation of being the worst, had spent much of his time in searching for hidden treasure, chiefly by means of incantations and similar delusions; and in 1827, after he had been established for some time in the western part of New York, began to give out that on the 27th of September in that year, through the guidance of an angel, he had discovered in the ground a writing engraved on plates of shining gold. This writing he translated and published under the title of the Book of Mormon. It appears that as early as 1809 one Solomon Spaulding, who after being a minister had turned merchant, began to amuse his leisure with writing a fabulous account of the origin of the North American Indians. It had been maintained by some that they were the descendants of the lost ten tribes of Israel; and Spaulding proceeding upon this idea completed his fiction, and gave it the name of The Manuscript Found. With a view to publication he placed it in the hands of a bookseller at Pittsburg, named Paterson, but died before the arrangements were concluded. The MS. thus left with Paterson was lent by him to Sydney Rigdon, one of his compositors, who took a copy of it. In some way not fully explained Rigdon became connected with Joe Smith, and the two conceived the idea of palming Spaulding's novel upon the world as a new Bible. In 1827 both Spaulding and Paterson, who could at once have exposed the imposture, being dead, the time for attempting it appeared to have arrived, and the Book of Mormon was published. The name given to it was evidently owing to the important part which Spaulding had assigned to Mormon and his son Moroni in his novel; but Smith and his coadjutors, instead of confining themselves to the original manuscript, had clumsily engrafted upon it a number of maxims, prophecies, &c., evidently garbled from the sacred volume, and interpolated in such a manner as to involve anachronisms and contradictions. Among rational men, therefore, there cannot be any difference of opinion as to the real character of Joe Smith's Golden Bible, but good care was taken not to bring it to the test of reason. Ignorance and fanaticism existed in sufficient abundance to furnish a nucleus of adherents, and the progress has since been such as to make Mormonism one of the most remarkable and successful impostures of modern times. On the 1st of June, 1830, when first organized as a sect at Fayette, it numbered only thirty members. In the same year Joe Smith, now styled, by virtue of a special revelation, seer, translator, prophet, apostle of Jesus Christ, and elder of the church, began openly to baptize. The inhabitants of Fayette, unable to tolerate his swindling blasphemy, threw out menaces which he did not deem it prudent to disregard, and he removed to Kirtland, in Ohio. Here, in consequence of a new revelation which enjoined his followers to consecrate all their property to God, he set up a bank, of which he was himself president, and his old associate Rigdon was cashier. In 1837 it stopped payment. This misadventure was a sufficient indication to the prophet that it was high time to decamp. His next locality was in Missouri, where for three years the Mormonites, at strife among themselves, and threatened with schism, were also engaged in incessant contests with their neighbours, who at last drove them out by main force. They now amounted to about 15,000; and having taken refuge in Illinois, founded the city of Nauvoo, and made Joe Smith its mayor, with full power to regulate all the affairs of the sect, both temporal and spiritual. Here for a time everything seemed to flourish. An immense 'boarding-house,' in which, according to a revelation, 'Joseph Smith and his house' were to have place 'from generation to generation, for ever and ever,' was built. This was followed by a temple, which was erected on the 6th of April, 1841, and cost nearly $1,000,000. A regular body of militia was also organized, which enabled the prophet to add to his other titles of president and mayor that of lieutenant-general, and he became so much elated as to announce himself as a candidate for the presidency of the United States. Rigdon had introduced the dogma of a 'spiritual wife,' which gave rise to violent internal dissensions. He persisted notwithstanding, and ultimately professed to have received revelations sanctioning systematic seduction. Smith was charged with countenancing this dogma, and was not believed when he denied it, because his advocacy of polygamy, and his possession of a harem vieing in the number of its inmates with that of Mohammed, were practical exemplifications of this very abomination. In the struggles which ensued he had recourse to violence, which brought him within the power of the civil authorities, and he was imprisoned at Carthage with a number of his confederates, preparatory to a trial for riot. While here the prison was forced by a mob, and nearly 200 men, rushing in with blackened faces and loaded muskets, commenced an indiscriminate massacre. Joe Smith and his brother Hiram were among the slain. This tragical event, which took place on the 27th of June, 1844, having given Joe Smith the reputation of a martyr, has, according to the usual rule in such cases, added to the number of his deluded followers. After a competition for the leadership between Rigdon and Brigham Young, the latter was successful, and the sect has since been rapidly increased, not only by accessions from the United States, but by large importations from different parts of the European continent, and, with shame be it said, from no country more largely than Great Britain, particularly its mining districts, both in Scotland and England. Shortly after Brigham Young's recognized ascendency the contest between

the Mormons and the general population was renewed, and ultimately issued in the expulsion of the former from Illinois. The removal of such an immense body was no easy task; but at last, after an extraordinary pilgrimage, a new locality was found in the far west, in the Great Salt Lake Valley, between the Sierra Nevada and the Rocky Mountains. Here Brigham Young arrived on the 24th of July, 1847. The main body of the Mormons arrived in August, 1848. Salt Lake City was founded, and large tracts of land brought under cultivation. An emigration fund was established, and a skilful system of propagandism set on foot, by which large numbers of converts were brought from Europe, and especially from Great Britain. A state was organized under the name of Deseret. Congress refused to recognize it, but erected Utah into a territory, and Brigham Young was appointed governor of it by President Fillmore. In the following year the United States judges were violently removed from the territory. This led to the deposition of Brigham Young, and the appointment as governor of Colonel Steptoe, who arrived in Utah in August, 1851. Not deeming his force sufficient to secure obedience, Steptoe, however, resigned his post, and retired to California. The Federal officers were then again driven out of Utah. In 1857 a new governor was appointed by President Buchanan, and a force of 2500 men sent to support him in his office. After some resistance the Mormons submitted, and the authority of the States was formally established; but the troops were soon after withdrawn, and they were left pretty much to themselves. During the civil war the Mormons remained neutral, and were left undisturbed. In 1870 Congress passed a bill to compel the Mormons to renounce polygamy, or quit the United States. General Shaffer was appointed governor, and instructed to carry out the decree. A prosecution was instituted against Brigham Young, who was sentenced to fine and imprisonment. In 1877 Young died and was succeeded by John Taylor, an Englishman, during whose presidency the States' government have passed several bills for the abolition of polygamy, but without virtual effect. The supreme head of the sect is the president, who is supported by two councillors; then come a patriarch, the council of 'The Twelve' or the twelve apostles, a number of bodies called the 'seventies,' high-priests, bishops, elders, priests, teachers, and deacons. See The Mormons, by Charles Mackay; Mormonism, by John Hyde; Rocky Mountain Saints, by T. B. H. Stenhouse.

MORNAY, Philip de (*sieur de Plessis Marly*), a distinguished French nobleman of the sixteenth century, was born in 1549, and was educated by his mother in the tenets of the Reformed religion. In 1567 he entered the army, and bore his part in the civil wars which at that period distracted France; but after the massacre of St. Bartholomew he left his country, and visited Switzerland, Germany, Italy, and a great part of the north of Europe, including England, where Elizabeth received him with distinguished marks of favour, as an able supporter of the Protestant cause. When in 1576 Henry of Navarre (afterwards Henry IV. of France) openly placed himself at the head of the Huguenot party, De Mornay once more took up arms, and continued in the service of this monarch during the whole struggle against the League; but when in 1593 Henry reconciled himself to the Church of Rome De Mornay sent in his resignation, and retiring from court, devoted the remainder of his life to literary pursuits, and to advocating with his pen the cause of that religion which he had defended with his sword. His first work, Traité de l'Église, appeared in 1578, and was followed in 1581 by Traité de la Vérité de la Religion chrétienne. His most able, as well as most celebrated work, was a treatise, De l'Eucharistie (1598), in which he vindicated the Calvinistic doctrine, as opposed to that of transubstantiation; and Cardinal Du Perron, two years after its publication, entering into a personal dispute with the author on the subject, in a conference at Fontainebleau, the latter maintained his argument with so much ability, as to acquire from the time of his own persuasion the appellation of the *Protestant pope*. In 1607 he printed a history of the Papacy, under the title of the Mystère d'Iniquité. This estimable man, whose learning, constancy, and unblemished morals acquired the respect even of his opponents, died in 1623, at his château of La Forêt, in Poitou, whither he had retired in 1621, after having been deprived of his government of Saumur by Louis XIII. His Mémoire et Correspondance pour servir à l'Histoire de la Réformation et des Guerres civiles, 1571–1623 (most complete edition, Paris, 1825, fifteen vols., with a sketch of his life), is a valuable contribution to the history of the time.

MOROCCO. See Marocco.

MOROCCO, or Maroquin, a fine kind of leather, prepared from the skin of the goat, originally brought from the Levant and the Barbary States, but now manufactured in most other countries. It derives its name from the Empire of Morocco or Morocco, where it was probably invented, or first became known to Europeans. The colours most commonly communicated to it are red (by cochineal) and yellow (by the Avignon or yellow berries).

MORON, or Moron de la Frontera, a town of Spain, in Andalusia, 32 miles north-east of Seville. It is irregularly built, and has no objects of any interest except a fine church, and the ruins of its ancient castle, which was long one of the most important strongholds of Spain. It was blown up by the French in 1812. Pop. 14,879.

MORPETH, a municipal and parl. borough in England, Northumberland, in a fertile and well-cultivated district, on the railway to Berwick, and on the Wandsbeck, here crossed by an elegant bridge, 14 miles north by west of Newcastle. It consists of two principal streets, and has a fine old parish church in the decorated English style. Its manufactures are inconsiderable, but its cattle fairs are important. It returns one member to Parliament. Pop. of mun. bor. 4556; of parl. bor. 33,459.

MORPHEUS, in Greek mythology, the son of Sleep and god of dreams. The name is from *morphe*, form, because of the variety of forms he assumed in dreams, or because he shaped or formed the dreams.

MORPHINE. In the seventeenth century it was known that a substance having peculiar properties could be obtained from opium; to this substance the name of '*magisterium opii*' was given; but it was not until the year 1816 that morphine was prepared as a well-defined organic base. To prepare this base opium is cut into pieces, which are macerated in water at about 38° until all the soluble matter is extracted; the liquid thus obtained is evaporated with addition of calcium carbonate in quantity sufficient to neutralize all the free acid. When the liquid is sufficiently evaporated calcium chloride is added, whereby calcium meconate is precipitated, along with a considerable quantity of colouring matter. By filtration and further concentration crystals of morphine hydrochloride are obtained mixed with hydrochlorides of the other opium bases (codeine, narcotine, &c.) From this mixed precipitate the morphine salt is separated by repeated crystallization and final precipitation with ammonia.

Morphine crystallizes in colourless, transparent

short, trimetric prisms, which are inodorous, have a very bitter taste, and are extremely poisonous. It is much used in medicine in small doses as a sedative.

Morphine is but very slightly soluble in *cold* water, *hot* water dissolves rather more of it, in alcohol it is sparingly soluble, ether does not dissolve it, but it is easily dissolved by aqueous alkalies. The analysis of morphine, and a consideration of its reactions, lead to the adoption of the formula $C_{34}H_{38}N_2O_6$. As morphine is an extremely poisonous substance, and may therefore be used with criminal intent, it is important that we should have means of readily and unmistakably detecting its presence. If the contents of a stomach, or other animal matter, have to be examined, it is necessary that the organic matter be entirely separated, and the morphine obtained in a pure state, before proceeding to apply tests for its presence. This process cannot be well described in an article like the present; when the morphine, however, is obtained pure the following tests may be applied.

(1.) A crystal of iodic acid is placed in contact with the supposed morphine, and a drop of a solution of starch in water is added, a deep blue colour (owing to the formation of starch iodide) is produced if morphine is present.

(2.) A drop of ferric chloride produces a blue colour with morphine; this colour is not permanent, it is destroyed by heat, by excess of acid, or by contact with alcohol.

Morphine is capable of polymerization (which see). By the action of sulphuric acid on morphine under certain conditions new substances, whose formulæ are double, triple, and quadruple that of morphine itself, are produced. There is a difference in the physiological action of morphine and its polymerides, the higher polymerides having a very marked emetic action. Morphine dissolves easily in dilute acids, forming a series of neutral salts, which may be represented by the general formulæ $M\chi$ and $M_2\chi'$, where M represents one molecule of morphine, χ one molecule of a monobasic acid, and χ' one molecule of a dibasic acid. Part of the hydrogen in morphine may also be replaced by organic radicals, such as methyl, ethyl, &c.

MORPHOLOGY, Animal, the division of biological science which deals with the structure and details of *form* of living beings. The term morphology is indeed equivalent to that of the 'science of *form*.' It comprehends three chief subdivisions. The first of these is *Anatomy*, which investigates for us the structure of the fully-grown being. *Development* makes us acquainted with the organism in its earlier stages, and traces its growth from the egg or seed to the period of adult life. And lastly, *Taxonomy* or *Classification* arranges for us those living beings with the structure and relative position of which, in the scale of creation, anatomy and development have made us familiar. Physiology, as the 'science of *function*,' is opposed to morphology, the former investigating the mode in which the vital *acts* or *functions* of living bodies are carried on. The investigation of living beings according to morphological details marks the newer era of zoology and botany; since a knowledge of the full structure of living organisms is the only true method by which we may become acquainted with their relations to each other, singly or in groups. Morphology thus lies at the foundation of all true systems of classification and arrangement; and it has demonstrated for us the existence of distinct and specific types of form in both animal and plant worlds. *Homology* (which see) might be regarded as morphology in a special sense, and as applied to the comparison of individual or specific parts in a single organism or in a series of organisms. Goethe was the inventor of the term, and this great metaphysical poet was the first to direct attention to the relations in structure presented by living beings, although the term as employed by Goethe had reference rather to the unvarying phenomena of animal and vegetable life than to the more specific sense in which modern biologists use the name. Goethe's work, entitled Beiträge zur Naturwissenschaft überhaupt und zur Morphologie insbesondere (Tübingen, 1817, et seq.), contains his views on the morphology of his day. The term 'metamorphosis of organs' is occasionally used in connection with morphological science, as applying to the complexities of use and structure in parts which it is the function of homology (as a branch of morphology) to trace and explain.

MORPHOLOGY, Vegetable (from *morphē*, form, and *logos*, doctrine), the science which treats of the formation and constant change of organic bodies. Goethe, the German poet, first formed the word, and treated the subject as a separate branch of natural history. In his Beiträge zur Naturwissenschaft überhaupt und zur Morphologie insbesondere he directs attention to the uninterrupted change of all bodies, particularly organic bodies, and the fact of their consisting, even when they appear as single individuals, of parts which contain the germs of individual life within them. He shows this to be the case with plants from their propagation by eyes and cuttings. The growth from seed appears to him quite a similar phenomenon. The appearance of Goethe's treatise drew the attention of botanists to the subject, and it is now universally admitted that all the organs of the plant are formed upon the plan of the leaf. The sepals of the calyx, the petals of the corolla, the stamens and pistils, are regarded, not as metamorphosed leaves, as they have sometimes been loosely described, but as parts sharing in the same fundamental nature as the leaf, being, to use the words of Lindley, 'constructed of the same elements, arranged upon a common plan, and varying in the manner of their development, not on account of any original difference in structure, but on account of special, local, and predisposing causes. Of this plan the leaf is taken as the type, because it is the organ which is most usually the result of the development of those elements, is that to which the other organs generally revert when, from any accidental disturbing cause, they do not sustain the appearance to which they were originally predisposed, and, moreover, is that in which we have the most complete type of organization,' and that, it may be added, which can always be distinctly traced by insensible gradations of structure into all the other parts. See Leaf.

MORRIS-DANCE (from *Morisco*, *Moorish*), supposed to have been derived from the Moriscos in Spain, was formerly danced at puppet-shows, May-games, &c., in England. According to some writers it was introduced into England in the reign of Edward III., when John of Gaunt returned from Spain; but it was more probably borrowed from France or the Low Countries. In the reigns of Henry VII. and VIII. it was a principal feature in the popular festivals. In the May-games of Robin Hood, and the pageant of the Lord of Misrule, morris-dancers formed an important part. The more ancient May-game and morris consisted of the following characters: Robin Hood, Little John, Friar Tuck, Maid Marian, the queen or lady of the May, the fool, the piper, and several dancers, variously habited. A hobby-horse and a dragon were afterwards added. In the reign of Henry VIII. the morris-dancers were dressed in gilt leather and silver paper, and sometimes in coats of white and spangled fustian. Bells,

to the number of thirty or forty, hung from their garters, and purses were stuck in their girdles. See Douce's Dissertation on the Ancient English Morrisdance, in vol. ii. of his Illustrations of Shakspere.

MORRISON, ROBERT, D.D., an eminent missionary and orientalist, born at Morpeth in 1782, of humble parents, who could only give him a scanty education, worked for some time as an apprentice with his father, a last-maker. His love of study, however, and the proficiency which he made under difficult circumstances, marked him out for something better, and in 1803 he was admitted to the Dissenting Academy at Hoxton, to study for the ministry. The following year, having offered his services to the London Missionary Society, he removed to the Mission College at Gosport, where he remained till 1807, and then embarked as a missionary for Canton. In 1808 he was appointed translator to the East India Company's factory at Canton. In 1810 he began to print the New Testament in Chinese from a text he had brought with him, and which he had carefully revised. In 1811 he completed a Chinese Grammar which was published in 1815. In 1814 he had completed the New Testament, and the East India Company sent out a press and materials to print the work. He now began with the assistance of Dr. Milne, who had joined him in 1813, the translation of the Old Testament. This work was completed in 1818. In 1815 he completed a Chinese Dictionary, which was published in 1821, at the expense of the East India Company. He received at various times £6000 from the British and Foreign Bible Society to assist in publishing his Bible. The Old Testament was published in twenty-one vols. 12mo. In 1824 he visited England, returning to China in 1826. He died in 1834. Dr. Morrison and his colleagues superintended very extensive printing operations for the diffusion of tracts and Scripture portions among the Chinese, nearly 10,000 New Testaments, and about 30,000 Scripture portions, having been printed between 1810 and 1836. Besides the works mentioned he wrote Horæ Sinicæ, or Translations from the Popular Literature of the Chinese (London, 1812); Dialogues translated from Chinese into English (by R. Morrison and others, Macao, 1816); A View of China for Philological Purposes, 1817; and several educational works in English and Chinese. His dictionary is highly esteemed.

MORSE, another name for the walrus or seahorse. See WALRUS.

MORSE, SAMUEL FINLEY BREESE, an American artist and inventor of the electro-magnetic telegraph, was born at Charlestown, Mass., April, 1791. He was educated at Yale College, where he devoted special attention to chemistry and natural philosophy; but after graduating in 1810 he determined to apply himself to art, and accordingly in the following year went to England with the intention of studying painting under Benjamin West. In 1813 he was awarded the gold medal of the Royal Academy for his sculptured model of the Dying Hercules. Returning to the United States in 1815, he continued to occupy himself with painting, and in 1826 he succeeded in establishing the 'National Academy of Design,' of which he was chosen to be the first president. About this time he was a lecturer on fine arts at the Athenæum, and became very intimate with Professor Dana, who lectured in the same institution on electro-magnetism. In consequence of this intimacy he began to take great interest in the subject of electro-magnetism, and by conversation with Professor Dana he became quite familiar with it. In 1829 he visited Europe a second time, and remained there for three years. In returning to America he was made acquainted by a fellow-passenger with the experiments that had just been made in Paris in electro-magnetism; and he was thus brought to conceive the idea of employing this power in telegraphy. Before the voyage was finished he had already made a plan for carrying out this idea; but it was not till 1835 that he was able to exhibit an instrument that was found to work well. By July, 1837, this instrument was perfected, and he at once submitted it to the inspection of Congress, with a request for means to construct an experimental line between Washington and Baltimore. After many vexatious delays the aid required was granted on the last night of the session of 1843: 30,000 dollars were placed at his disposal, and the proposed line was finished in the following year. Since that time Mr. Morse's instrument has been made use of in all the states of his native country, and it is also very extensively employed on the continent of Europe and elsewhere. In 1857 the representatives of ten countries met at Paris, and voted him a donation of 400,000 francs, in recognition of the benefits that his invention had conferred on the world. He died at New York, April 2, 1872.

MORSE'S TELEGRAPH. See TELEGRAPH.

MORTALITY. The law of mortality is that which determines the proportion of the number of persons who die in any assigned period of life or interval of age, out of a given number who enter upon the same interval, and consequently the proportion of those who survive. Tables showing how many out of a certain number of infants, or persons of a given age, will die successively in each year till the whole become extinct, are generally called tables of mortality. There is no fixed number of lives upon which such tables are based, but the observation of a large number is indispensable to accuracy, and the larger the number that can be duly observed the greater will be the degree of accuracy attained. It must always be borne in mind, however, that a strict observation of a moderate number will yield truer results than a looser induction from a larger number. The basis of such calculations must be an accurate register of the number of births and deaths, and in the case of the latter, at what ages, in a given district or extent of country. In England the bills of mortality, or abstracts from parish registers, were long the only means of arriving at these results; but being found very imperfect and unsatisfactory, they were supplanted in 1836 by a general registration. The results furnished by such tables are very various, and of great interest. The registers, if kept with sufficient accuracy and minuteness, enable us to determine the proportion of deaths, not only at different ages and in different regions, but at different seasons, in persons of different occupations and habits, in towns, or the country; and thus afford valuable materials for the science of political economy. Although much more attention has been paid to this subject in recent times, yet the observations have not been so extensive nor so accurate as is desirable. John Graunt, a London haberdasher, issued in 1661 a work entitled Natural and Political Observations upon the Bills of Mortality, chiefly with reference to the government, religion, trade, growth, air, diseases, &c., of the city of London. Graunt was made a Fellow of the Royal Society in 1662. He died in 1674. He is said to have left his papers to Sir William Petty, and a sixth edition of his work was published in 1676, which Petty is said to have edited. Evelyn in his memoirs, and other writers say that Petty was the real author or prompter of the original work; but J. R. MacCulloch, who has reviewed the question, does not think there is sufficient ground for their assertion. This was the first attempt to deal scientifically with the data of mortality, and

is said to have approximated to the results on which life assurance is founded.

Although the collection of regular statistics of mortality is of recent origin, and the mode of collecting them yet leaves much to be desired both in regard to precision and to accuracy, the subject has always excited much interest, and a good many general facts have been collected regarding it, whether from general observation or from statistics. The tendency of mortality to diminish with the progress of civilization has been satisfactorily established by statistics. The average rate of mortality is affected by regular or constant causes, such as race, climate, age, sex, profession, social position, density of population, political institutions, habits, &c., and by such irregular or occasional causes as war, famine, pestilence, &c., but notwithstanding the interruption of these occasional causes a constant tendency to a mean has been found to exist in any given state of society. The fact that the tendency of population to increase or diminish is quite independent of the rate of mortality was first established by Malthus, who showed that the increase of population depended on the facility of procuring the means of subsistence and not on the duration of life. The mortality in the United States, for example, is greater than in England, yet the population of the United States doubles itself in twenty-five years, and that of England in forty-three years, while in various European countries which have a lower mortality than the United States, the population will not double in a century.

Some statists have attached considerable importance to the effects of race on population. It is extremely difficult, however, to establish anything in regard to race independently of circumstances and social habits. It has been shown, for example, that the average mortality among the Jews in Prussia is less than among the Christians, that the mortality varies greatly among the various races who inhabit the Austrian Empire, being least among the Germans, and that a similar difference prevails in the departments peopled by various races in France, but all such evidence is open to the most obvious exceptions. The influence of climate on mortality is inseparably associated with that of migration. It cannot be established that any climate, except perhaps the extremes of heat or cold, moisture or dryness, is in itself exceptionally favourable or unfavourable to human life, but change of climate is frequently adverse to it. An observation made by Vitruvius has been upheld by some modern authorities, and an array of facts marshalled in favour of it, that migrations from south to north are better sustained and established against the influence of an excessive mortality than those from north to south. Within certain limits it is probably true that healthy people going from a temperate climate to a severer one are less liable to suffer in health than those going to one proportionally milder, but even this cannot be laid down as a general rule, much less can the rule be extended to all migrations indiscriminately. The West Indies, Guiana, and particularly the west coast of Africa within 20° north of the equator, are among the regions most adverse to European constitutions. On this part of the African coast European colonies can hardly be established, while even in many parts of the West Indies they are only maintained by continuous immigration, and Chinese and Coolies do not appear to fare much better than Europeans. The most remarkable fact in respect to age is the great mortality which commonly takes place among children under five years of age. This is especially remarkable in large towns, but is not wholly confined to them. Although the diseases to which infancy is liable may naturally account for part of this excessive mortality, the greater part of it must be attributed to ignorance and want of due care in the training of children, partly arising from the unfavourable circumstances in which, through the too rapid increase of population, they are brought into the world. This is both directly and indirectly a considerable cause of the extra mortality of large towns and other dense centres of population. The question whether town or country life is most conducive to a low rate of mortality is still undecided. Direct statistics prove nothing, as the death-rate of towns is raised by immigration from the country and other causes. (See CITY—Medical Statistics of Cities.) In regard to sex it is established that women live longer than men, and that among men the married live longer than the single. For the influence of profession see LONGEVITY. The condition of life in respect of poverty or wealth is known to have a considerable influence on mortality. Dividing the departments of France into two classes, as rich and poor, the annual mortality was found to be 1 in 46 in the former, and 1 in 33 in the latter. In the town of Dijon a similar division of the population gave to the rich an average duration of life of 57 and to the poor one of 37 years. The effect of social and political institutions may be estimated from the fact that while in England the death-rate is about 22 to 23 per thousand, in the Ottoman Empire it is about 55.

The first table of mortality was constructed by Dr. Halley, from the mortuary registers of Breslau for five years ending with 1691, and was inserted in his paper on the subject in the Philosophical Transactions for 1693, with many useful observations on the purposes to which such tables may be applied. In 1742 the celebrated work of Süssmilch on this subject appeared under the title of Die göttliche Ordnung in den Veränderungen des menschlichen Geschlechts, &c. (two vols.), of which a third edition was published in 1775, with a supplementary volume by Baumann. Since that period many valuable works have been published on the subject by Deparcieux, Struyck, Birch, Muret, Messance, Price, Krafft, Barton (American Phil. Soc. 1793), &c., and registers have been kept more generally and with greater care. See ANNUITIES and REGISTRATION OF BIRTHS, DEATHS, AND MARRIAGES.

MORTAR is a mixture of sand with slaked lime and water. When exposed to the action of the air this mixture absorbs carbon dioxide and 'sets,' forming a hard, compact mass. See LIMESTONE.

MORTAR is a kind of short cannon, of a large bore, with a chamber. (See Pl. CXXXIII.) Mortars are either made of brass or iron. Their use is to throw iron shells filled with powder, which falling on any building, or into the works of a fortification, burst, their fragments destroying everything within reach; also balls of stone, carcasses (which see), bags filled with grape-shot, &c. They were first used in sieges for throwing great balls of stone and of red-hot iron, before the invention of shells. On this account the calibre of a mortar, in Germany, is generally estimated by the weight of a stone the size of the bomb which it is intended to throw. In Denmark and Russia, on the contrary, the calibre is estimated by the actual weight of an iron ball fitting it; in Britain and France, by the diameter of the bore. The fire conducted from mortars is what is termed vertical fire, the mortar being directed at a high angle and the shell striking the ground nearly vertically. The range is not generally obtained by an adjustment of the elevation, which is kept fixed, but by proportioning the charge to the required end. The difficulties of firing with any degree of accuracy on such a system are very great. In the last few years short rifled pieces of ordnance have been fired

at very high angles with fixed charges and varying elevations. The Prussians fired their new mortars or cannon for vertical fire on this principle during the French war, and the English employed a short steel mountain gun in Abyssinia thus. The rifling of mortars has hardly been attempted until quite recently. The pieces now coming into the British service, performing the part of mortars, are rifled howitzers of large calibre, with which fair results have been obtained.

The principal recommendations of vertical fire are, that the shells search behind cover and produce a great moral effect, also that at high elevations a great range is obtained with a comparatively small charge of powder. The maximum in vacuo would be at 45°. Owing to the resistance of the air the piece should for this purpose be pointed nearly 2° lower (namely, at about 43°). Shells are the special projectiles fired from mortars. Some systems of defence have, however, been made to depend on the fire of case and grape from mortars, especially that of Carnot. The moral effect of the falling case-shot is great, but the projectiles spread over the ground almost from the muzzle of the mortar, and cannot be directed on to any definite spot, nor is their falling force very great. Shrapnel fired in this manner made to burst with time fuzes near the ground would undoubtedly be much more formidable. Common, or as they are termed, mortar-shells are very destructive to material; they are generally fitted with time fuzes set rather long. Shells fired in this manner are surprisingly harmless to men. Bursting on or often half in the ground the fragments of iron are either buried in the earth or projected wildly up into the air and fall completely at random. Consequently in a siege the spectacle of a shell exploding within a few feet of many men and hurting no one is very common indeed. During the siege of Sebastopol the English artillery when firing mortar-shells into works crowded with troops burst them just before reaching the ground, with terrible effect. At the battle of Solan the French dead were found torn into masses of 'flesh and rags' by Prussian common shell. As concerns troops, however, a much larger number of men might be disabled by shrapnel bullets. Hand grenades are fired from mortars in considerable numbers. A wood bottom must be employed to carry them well to the front. Their effect much resembles that of vertical case and is chiefly moral. The use of mortars is thought to be older than that of cannon, for they were employed in the wars of Italy to throw balls of red-hot iron and stones long before the invention of shells. It is generally believed that the Germans were the inventors, and that they were used at the siege of Naples, in the reign of Charles VIII., in 1435. It is more certain that shells were thrown out of mortars at the siege of Wachtendonk, in 1588, by the Count of Mansfeld. For further information see BOMB, GUN, and HOWITZER.

MORTGAGE, in English law, is a pledge of land, tenement, or other immovable property, as a security for debt, on condition that if the debt be not repaid in the time and manner specified in the mortgage the pledge shall be forfeited. The name mortgage was originally used in opposition to *vifgage*, in which the lender held the estate until the rents and profits covered the principal and interest of his loan, upon which it reverted to the borrower; while in mortgage on the failure of the borrower to redeem the pledge the forfeiture becomes absolute. Mortgages in England may be either legal or equitable. A legal mortgage must be in writing, but there is no particular form necessary to establish it, so that a conditional contract of purchase may sometimes be mistaken for a mortgage. An equitable mortgage may be constituted by a deposit of title-deeds. It in fact constitutes an acknowledgement of a grant of security for advances, and implies an engagement to execute a legal mortgage if required. Such a deposit will cover advances made subsequently to it. Joint-stock shares may also be mortgaged in this way. If the mortgage is not duly redeemed in the time and manner specified in the instrument by the mortgager, the mortgagee acquires by law the absolute title to the property. Equity, however, overrules this condition of the common law and gives the mortgager a right of re-entry on his property on condition of subsequent payment of his debt or obligation with interest. This is called his equity of redemption. It may be exercised within twenty years of the mortgagee's entry on the estate or of his last-written acknowledgment of the mortgager's interest in it. The mortgagee, on the other hand, may at any time after the violation of the condition of the mortgage, by filing a bill of foreclosure, compel the mortgager either to redeem his pledge or forfeit his equity of redemption. The time usually allowed to the mortgager for redemption under a bill of foreclosure is six calendar months, but the equity courts give every indulgence to a mortgager before allowing the mortgage to be absolutely foreclosed, and will renew the time several times if there is any prospect of the debtor being able to pay. See FORECLOSURE.

Mortgages on the estates of infants or lunatics are only allowed in special cases. In Scotland a mortgage is called an *heritable bond*. See HERITABLE SECURITIES.

MORTIFICATION, in medicine, is the death of a part of the body while the rest continues alive, and often in a sound state. If the part be a vital organ, as the lungs, its death must necessarily be followed by that of the whole person. Mortification is distinguished into *gangrene* and *sphacelus*, when occurring in soft or fleshy parts, as in the stomach or the limbs; and *caries* when in a bone, as in the spine, in the skull, &c. Gangrene is imperfect mortification, and is the name applied when any warmth, sensibility, or motion remains in the part; sphacelus is complete mortification. Mortification is generally induced by inflammation, by exposure to freezing cold, by hospital fevers, by languid, or impeded, or stopped circulation, as in cases of bedridden or palsied persons, and by improper food, particularly the spurred or mildewed grain. It may be recognized, when preceded by inflammation, by the following signs: subsidence of pain, heat and redness, and loss of sensibility; brown lividity, blistered skin, with bloody serum in the vesicles, offensive odour occurring in the part, and by a small, rapid, intermitting pulse; by shiverings followed with cold sweat, diarrhœa, delirium, hiccup, dejection of spirits, and by a wild, cadaverous countenance. When a part having been frozen is suddenly exposed to heat, mortification rapidly ensues; the part becomes florid; inflammation is unsuccessfully attempted, and sphacelus is the result. In the above species a distinctly marked line divides the dead and living portions; often a healthy separation ensues. Mortification is common in the fevers, wounds, and injuries of the crowded jails and military hospitals of Europe. This gangrene is considered contagious by some surgeons, the nurses and orderlies suffering from ulcers and sloughs on the hands, when touched with the sponges used in cleansing the sick. The same effect is produced on the sound portions of the skin of the sick. This hospital gangrene is distinguished by its rapid spread to contiguous parts, as from fingers to arms, by the oozing of grumous blood, by horrible fetor, by fatal depression of spirits, and by the sullen despair of patients who, on the day of battle or of amputation,

were the bravest of the brave. Sometimes the cutting a nail to the quick, or a slight bruise, will induce gangrene in old or debilitated persons.

MORTIFICATION, or MORTMAIN (in Scotch law), an extinct tenure by which before the Reformation lands given to the church were held. At the Reformation such lands were declared by the Act 1587, cap. xxix. to have been given for superstitious purposes, and were vested in the crown. Since the Reformation lands given for charitable purposes are disponed to trustees to be held for the charity either in feu or blench. See HOLDING.

MORTISE and TENON. See CARPENTRY.

MORTMAIN (English law). Lands held by a corporation are said to be held in mortmain (*mortua manu*, by dead hand); the meaning of which is that the estate is a perpetuity, or in other words, is not alienable. The expression has particular reference to estates held by the religious and eleemosynary corporations in England, which became objects of jealousy very early, it being apprehended that all the lands of the kingdom might come by conveyances, prompted by the piety or superstition of proprietors, into the hands of those corporations. Accordingly, conveyances and devises to corporations, civil or ecclesiastical, were forbidden by *magna charta*, and have been restrained and interdicted by subsequent statutes. By 7 and 8 William III. a license from the crown dispenses from the statutes of mortmain, and by 34 Victoria, cap. xiii. (1871), gifts and assurances of land for public parks, museums, and schools, are exempted from the statutes of mortmain.

MORVEAU, BARON LOUIS BERNARD GUYTON DE, a celebrated chemist, born at Dijon, January 14, 1737, distinguished himself in 1773 by the invention of the method of purifying the atmosphere by means of chlorine, which is now generally employed with the greatest success. Morveau was previously general advocate of the parliament at Dijon, an able man of business, eloquent and upright. He founded a school at Dijon for his favourite study, chemistry, and during thirteen years himself conducted it. In 1801 appeared his Description complète des Procédés de Désinfection. In 1791 he was made member of the national assembly, and afterwards of the convention. At the battle of Fleurus he ascended in a balloon. In 1797 he retired to private life. Subsequently he was chosen a director of the Polytechnic School, which he assisted to establish, and a member of the Institute. After the restoration he was pensioned. He died January 2, 1816. His wife translated several chemical works from the English, Swedish, and German; also Werner's Treatise on the Exterior Characters of Fossils (1790).

MOSAIC, an imitation or reproduction of a painting or ornamental design, formed generally by means of pieces of opaque glass of different colours; also by coloured stones (especially marbles and precious stones) placed side by side, and attached by being bedded in a cement. We know nothing with precision of the invention and history of this art in antiquity. Probably it originated in the East, but received its perfection from the Greeks, and was thus conveyed to the Romans. In Italy, and in most of the countries occupied by the Romans, many floors ornamented with mosaic work have been found amongst ancient ruins. Afterwards, when the arts and sciences were almost entirely driven from Italy by the distracted state of the country, this art declined in Italy, but was much cultivated by the Byzantine Greeks, and was largely employed by them in the decoration of their churches. It was afterwards revived in Italy, the Venetian school becoming very celebrated. Clement VIII., at the commencement of the seventeenth century, had the interior of the dome of St. Peter's decorated with this kind of work. The art was now employed for copying paintings by famous artists, and thus rendering permanent their original freshness and beauty; for one of the greatest advantages of this branch of art is its wonderful power of resisting decay. Enamels of a vast variety of shades were found necessary to give in perfection the gradations of tone and colour of the originals, and the art by and by reached a high degree of perfection. To this result the two Cristofori, who founded, at the commencement of the eighteenth century, a school for mosaic in Rome, greatly contributed; and many of their scholars carried the art to a still higher degree of excellence. The Roman school of mosaicists is still the most famous, though excellent works have been produced in recent times by Venetian and also by Russian artists. There is a studio for the production of mosaics in the Vatican. The most important works executed here in recent times are a series of portraits of the popes from St. Peter to the present pontiff, placed above the arches of the nave of the new church of St. Paul outside the walls of Rome. The pictures take in the head and bust, are circular in form, larger than life-size, and form a continuous frieze along the two sides of this large church. The great majority of the pictures that decorate the altars of the chapels in St. Peter's at Rome are works in mosaic. To suit the great scale of the building, the pictures are generally produced on a much larger scale than their originals; and so perfectly are they copied, and so neat the joinings of the many pieces of which they are composed, that it needs close examination to distinguish them from paintings. Among the most notable of these may be named the Transfiguration, after Raffaele; the Communion of St. Jerome, after Domenichino; the Crucifixion of St. Peter, after Guido; and the Incredulity of St. Thomas, after Cammucini. The colossal pictures of the four evangelists that decorate the spandrils of the dome of St. Peter's are also in mosaic. Some idea of their immense size may be formed when we mention that the pen in the hand of St. Luke is 7 feet long. In the most costly mosaics precious stones have been cut to furnish materials; but in common works of this art enamels of different colours, manufactured for the purpose, are the material employed. Roman enamels are made of small rods of opaque coloured glass. In the first place cakes of glass are made of every variety of colour and shade likely to be required. As many as 10,000 shades are said to be in use. These cakes are drawn out into rods thicker or thinner, according as they are to be used for finer or for coarser work, a great number being mere threads. They are kept in bundles, and arranged in sets corresponding to their colours. For a work of moderate size a piece of dark slate or marble is prepared by being hollowed out like a box and filled with plaster of Paris; upon this plaster the artist draws the design or pattern, and the workman proceeds with his work by removing small squares of the plaster, and filling in these with pieces cut from the glass rods, the pieces being fixed in their places by a cement. Gradually, in this manner, all the plaster is removed, and a picture is formed by the ends of the pieces of coloured glass. It will easily be understood that this is a very slow process, and there are large pictures that have taken as many as from twelve to twenty years to produce. When mosaic pictures are to be viewed near at hand they are polished perfectly smooth with a flat stone and emery, and present a glossy surface similar to that of paintings in oil. When they are to be viewed at a distance the surface is left rough, when they present an appearance similar to pictures in fresco. The evangelists in the spandrils of St. Peter's, and the

portraits of the popes, already mentioned, have their surfaces quite rough, and show considerable irregularity in the height of the component pieces when viewed close at hand. Inlaid works, of agate and other costly stones, are executed on the same principle as mosaic, except that the stones are larger, and cut to the shape of different parts of the object to be represented. Works of this class are known as Florentine mosaics. Flowers and ornamental designs are the chief objects of this branch of the art. A mode has been invented of sawing the plate with the mosaic pictures into two or three sheets, and thus increasing the number of works produced at one time.

MOSAIC GOLD, an alloy of copper and zinc, which is prepared by fusing equal parts of these metals at the lowest possible temperature, and adding zinc little by little, until the fused mass, after passing through various shades of colour, becomes perfectly white. When cast in a mould and cooled this alloy has the appearance of gold, and does not alter on exposure to the air.

MOSAIC WOOLWORK. By referring to the article MOSAIC the reader will easily understand how a block of wood constructed of hundreds of differently-coloured splints will, if cut horizontally, produce a number of repetitions of the original design. By an application of this principle to woollen threads the Messrs. Crossley of Halifax have been able to produce rugs and carpets having a definite design without going through the ordinary processes of weaving or printing. For many of the rugs colours and shades amounting to above a hundred varieties in all are required. An artist is employed to copy, of the exact size for the rug, a design generally taken from the paintings of some celebrated master. This picture is then ruled off into squares of about 12 inches each; this is copied upon lined paper by girls, each taking as much of the design as will occupy a square foot. A square is given to a woman (called the mistress of the frame), who has to match all the colours in wool; the threads are about 200 inches long, and are of sufficient number to pack closely together into a mass of 1 square foot in width and depth. A strong cast-iron frame, 17 feet long, is so arranged that all these threads can be stretched upon it horizontally, tied at one end, and weighted with 4 lbs. to each thread at the other. Young girls, under the direction of the mistress of the frame, arrange the threads one by one, fastening them at one end and weighting them at the other, and supporting them in the middle by a steel bar. On the completion of this process the mass is cut up into blocks of 20 inches long each. The same processes must be gone through for every square foot of the pattern, so that for a rug measuring 6 feet by 2 twelve masses of about 50,000 threads each are required. The blocks cut from the mass are set in an iron frame side by side, forming a solid of 6 feet by 2, and 20 inches deep, the threads being arranged vertically. The upper ends of the threads are shaved off, to present as smooth a surface as possible. India-rubber, dissolved in camphine to the consistency of carpenters' glue, is applied to the top in three coats, and a backing of canvas or other strong fabric, covered with the solution, is fixed upon the mass by careful rubbing and scraping, care being taken that every fibre adheres. When dry the mass of threads is raised three sixteenths of an inch by screwing up the movable bottom of the frame, which is then placed on a rail and connected with a fine endless screw. The screw is set in motion, which carries the frame forward to a circular knife with a very keen edge, revolving 170 times a minute. By this means a horizontal slice of three-sixteenths of an inch is severed, which, when turned up, presents the picture complete in a beautiful soft nap of woollen threads. A repetition of the same process converts another slice from the mass into a second rug, and and so on until about 100 rugs are got from the mass of 20 inches in depth. One thousand rugs are thus obtained from the block prepared as we have already described; and it is this power of repetition which makes the manufacture pay, for the labour of preparing and arranging so many distinct threads could not otherwise be remunerative.

MOSCHELES, IGNAZ, a German pianist and composer, was born at Prague, 30th May, 1794. He early displayed a strong inclination for music, and his father, a Jewish merchant, placed him under the care of J. D. Weber, director of the Prague Conservatory of Music, and afterwards under that of Albrechtsberger and Salieri, at Vienna. On the completion of his studies he made a successful professional tour in Germany, and in 1820 arrived in Paris, where he met with an exceptionally enthusiastic reception. He then crossed the Channel, and created an immense sensation in London by his bold and free style, his precision of fingering, his skilful improvisation, and his effective compositions. He returned to Germany in 1823, but two years later was again in London, where he became professor of music at the Royal Academy. Here he had the young Thalberg for a pupil, as he had formerly, in Berlin, had Mendelssohn. It was at the request of the latter that he gave up his London professorship and went to Leipzig to occupy a similar position in the conservatory there. He held this position till his death in 1870. Among his finest compositions may be mentioned his Concertos Nos. 3, 4, and 5; the Concertos Fantastique and Pathétique; his great Sestett and Trio; his Sonatas Caractéristique and Melancolique; and his studies.

MOSCHUS, a Greek pastoral poet, was a native of Syracuse. The time when he flourished is not accurately known, some making him a pupil of Bion, who is supposed to have lived under Ptolemy Philadelphus, while others suppose him a contemporary of Ptolemy Philometer (B.C. 160). The tenderness with which he speaks of Bion, in his beautiful elegy on that poet, implying a personal acquaintance, seems to render the former opinion most probable. Four idyls form the whole of the remains of Moschus, which exhibit great elegance of style and delicacy of conception. They are generally printed in conjunction with those of Bion. See BION.

MOSCOW (Russian, *Moskwa*), the second town of the Russian Empire, formerly its capital and sole imperial residence, till Peter the Great selected St. Petersburg for that purpose. It is the chief town of the government of the same name, and is situated in a highly-cultivated district on the Moskwa, 400 miles south-east of St. Petersburg, with which it is in direct communication by rail. It is surrounded by a wall or earthen rampart, 26 miles in circuit, of irregular shape, and altogether useless for any purpose of defence. A considerable portion of the inclosed space is unoccupied by buildings, has an undulating surface, and is traversed by the navigable Moskwa, which, entering at the middle of the west wall, makes a series of serpentine windings, in the course of which it receives the Iaousa and the Neglina, and quits the city at the south-east corner. The general view of the town, as seen from the Sparrow Hill, an eminence on the south-east, is peculiarly striking and picturesque. Its hundreds of churches and convents, surmounted by gilt and variously-coloured domes and spires, its imperial and other palaces, its boulevards, gardens, ponds, and, above all, the high walls and numerous stately towers of the Kreml or citadel, produce an effect unequalled by any other European city. It formerly comprised five principal

divisions: the Kreml (Kremlin), Kitaigorod, Bjeloigorod, Semljänoigorod, and the Sloboden or suburbs, each part being separated from the other by walls, of which now only those of the first two mentioned districts remain. The Kreml, situated on the north bank of the river, forms the centre of the town, and in it are found the principal civil and ecclesiastical buildings. Here are to be seen the Terema or old palace of the czars, the Bolstroi or Alexanderski Dvoretz (Large or Alexandrine Palace, built by the Emperor Alexander), and the Maloi Dvoretz, or Little Palace, built by Nicholas. The Cathedral Square, on the summit of the Kreml, contains the Cathedral of the Assumption, founded in 1326, rebuilt in 1472, a clumsy building with heavy pillars, which support five cupolas, and like the walls glittering with grotesque frescoes of sacred subjects, painted on a golden ground; the Church of the Annunciation, in which the emperors are recrowned, paved with jasper, agates, and carnelians; the Cathedral of St. Michael (Arkhanghelski Sabor), a sombre building, in which almost all the sovereigns, from Ivan Danilovitch down to Peter the Great, are buried; the Palace of Arms, an immense building lining the sides of a triangle, one side being occupied by the senate, and the other two by the treasury and arsenal. The chief attraction is the upper story of the treasury, containing the crowns of the early czars, several thrones, warlike trophies, and miscellaneous curiosities; the arsenal contains 100,000 stand of arms, the cannon taken from the French during their retreat, and numerous other military trophies. Near the centre of the buildings of the Kreml is the tower of Ivan Veliki, which rises to the height of 209 feet, and is surmounted by a gilded dome, on which the cross is displayed above the crescent. The great Czar Kolokol, or king of bells, the largest in the world, stands at the bottom of the tower on a granite pedestal, to which it was raised in 1832, after having remained for a century buried on the spot where it had fallen when the tower in which it was suspended was burned down. The walls of the citadel are surmounted by eighteen towers, and pierced with five gates. Outside the Kreml the chief buildings are the cathedral of St. Vassili, one of the strangest specimens of architecture anywhere to be met with, having no less than twenty gilded and painted domes and towers, all of different shapes and sizes. Among the principal educational establishments are the imperial university, founded in 1755 by the Empress Catharine; it consists of four faculties, is attended by about 2500 students, and has a library of about 200,000 volumes, an observatory, and botanic garden; five male and three female gymnasia; technological, agricultural, oriental, commercial, military, and other schools. The benevolent and charitable institutions comprise the Alexander and Catharine Hospitals, two military hospitals, &c.; the foundling hospital, in which all children are received on presentation without any questions being asked, supports about 5000 children within its walls, besides many thousands brought up in the city and its neighbourhood. Other buildings worthy of notice are two theatres, the great riding school, the Gostinnoi Dvor or principal bazaar in the Kitaigorod, a colossal building of three stories, where the leading wholesale merchants carry on their business; the Riadi, in the same quarter, occupied by narrow streets of shops. The number of the open and planted spaces throughout the city is great, but otherwise the streets are narrow, uneven, and crooked, lined by mean-looking brick and wood houses. Moscow is the first manufacturing city in the empire, and of late years its industrial and commercial activity has greatly increased. According to a recent report the manufacturing establishments amount to 1000; giving employment to more than 90,000 workmen, and annually turning out goods to the value of £10,000,000. The principal establishments are for textile fabrics, chiefly woollen, cotton, and silk, besides hats, hardware, leather, chemical products, beer, and spirits. The machinery employed in the factories is generally of the most improved description, but from the want of coal the consumption of wood for the furnaces is enormous. From its central position Moscow is the great entrepot for the internal commerce of the empire. Great facilities for this commerce are given by water communication, which extends on one side to the Baltic, on another to the Caspian, and on a third to the Black Sea; and by the railways to St. Petersburg, Jaroslav, Nijninovgorod, &c. In winter the traffic over the snow in sledges is enormous; as many as 3600, loaded with goods for Tiflis alone, have been known to leave the city in a single year.

Moscow, for administrative purposes, is divided into twenty-one districts, and is under the immediate charge of a general and military governor. It is the seat of important civil and criminal courts, and of various superintending boards of police, manufactures, trade, &c.; and has several literary, scientific, and other societies, among which one of the most prominent is the Bible Society, established in 1813. The foundation of the city dates from 1147. Its nucleus was the Kreml, which at first was nearly surrounded by a palisade, and formed an important military station. For a long time it continued to be a dependency on the principality of Vladimir; and in 1238, when the cruel Batou-Khan devastated Russia, it was both sacked and burned. In 1293 it was again sacked, and the inhabitants were dragged away into slavery by Khan Nagai. It afterwards became a prey to intestine dissensions, several princes disputing the possession of it; but at last Dimitri, surnamed Donskoi, became sole master, and died in 1389, after having done more for its prosperity than any one into whose hands it had previously fallen. From this time its prosperity continued to advance, though not without repeated interruptions by fire, pestilence, famine, and war. It now became the capital of Muscovy, and afterwards of the whole Russian Empire; but was deprived of this honour in 1703, when St. Petersburg was founded, and became the royal residence. It still, however, possesses all the grandeur and many of the other features of a capital. Many of the nobility reside in it, and both in salubrity and central position it possesses natural advantages which no political preference can ever confer on St. Petersburg. The principal event in the history of Moscow is the burning of it in 1812 for the purpose of dislodging the French from their winter quarters. The damage then done has been long since repaired, and Moscow has risen from her ashes more beautiful than ever. Pop. 1882, 750,867.

MOSELLE (German, *Mosel*), a river of Europe, which rises in France on the south-east of Remiremont, in the department of the Vosges, across which it flows north-west through the department of Meurthe-et-Moselle, whence it proceeds N.N.E. through German Lorraine into Rhenish Prussia; and after passing Trèves in a remarkably winding course, falls into the Rhine at Coblenz; total course, about 360 miles, of which 220, commencing at the junction of the Meurthe, are navigable. Its principal affluents are, in France, on the right bank, the Vologne, Meurthe, which joins it below Nancy, and Seille, which it receives at Metz; on the left bank, the Madon, Math, Orne; and beyond France, on the right bank, the Sarre, which joins it above Trèves; and on the left bank, the Sure, Kill, and Elz. Of these affluents the Meurthe, Sure, and Sarre are navigable.

MOSELLE, formerly a department of France, bounded on the north by Rhenish Prussia and German and Belgian Luxemburg, east by Rhenish Prussia, south by Bas-Rhin and Meurthe, and west by Meuse; length, east to west, 107 miles; greatest breadth, 41 miles; area, 2034 square miles; population, 452,157. The south-eastern and major part of it was ceded to Germany in 1871; the remainder is united to Meurthe, and the department thus formed received the name of Meurthe-et-Moselle (which see).

MOSES (Hebrew, *Moshch;* in the Septuagint and Vulgate, *Moyses;* Coptic, *Mo-ushe*, that is, drawn out of the water), leader, prophet, and legislator of the Israelites, was born in Egypt about 1600 B.C., among the then severely oppressed Hebrew people. Three months after his birth his father, Amram, and mother, Jochebed, both of the race of Levi, were obliged to expose him in obedience to a royal command, which enjoined that all the male children of the Hebrews should be put to death. But the daughter of the Egyptian king (a tradition preserved by Josephus names her Thermutis), going to bathe in the Nile, found the child exposed in a carefully-constructed basket of bulrushes upon the border of the river, and took compassion upon him. His sister Miriam, who was standing near, offered to procure him a nurse, and immediately summoned his mother. The feelings of his unhappy people were therefore instilled into him with his mother's milk; and he returned, when he had reached a fit age for instruction, to the king's daughter, who adopted him as her son. He was probably educated for the duties of the priesthood, to which the royal family belonged, and could now, as the disciple of the priests, attain to all the arts and knowledge which this privileged caste carefully confined within the limits of their order. The means of instruction thus afforded him were the best which his time possessed; and Moses penetrated still deeper than his instructors into the secrets of their religion, physics, legislation, and government, as appears plainly from his words and actions. His expedition into Ethiopia, in the fortieth year of his age, as leader of the Egyptians, when he subdued the city of Saba (Meroe), won the affections of the conquered Princess Tharbis, and married her, rests only on the tradition preserved by Josephus. Yet Moses could not forget his people in the splendour of a court. An outrage committed by an Egyptian on a Hebrew excited his anger, and he secretly slew the Egyptian. But this deed became known, and he escaped the vengeance of the king only by a hasty flight into Arabia. Here he took refuge with Jethro, a Midianitish prince and a priest, and espoused his daughter Zipporah, whom at their first meeting he had protected from the rudeness of some shepherds. Thus the adopted son of a king's daughter became the herdsman of an Arabian, and history does not say that he aspired to anything greater. But the misery of his nation must have been continually present to his mind, and not in vain had he been led by extraordinary means into the sanctuary of Egyptian wisdom, and endowed with the rarest powers and knowledge. This knowledge occupied his mind in his solitude, and explained to him the secrets of nature, whose mysteries and wonders addressed him in a solemn tone amid the deserts and mountains of Midian, and elevated his heart to that God whom he discerned more clearly than his fathers. Yet the germ of his great undertaking remained for a long time maturing in his mind before it was brought to light and assumed the form of a deeply-meditated plan. Moses had already attained to an age which gives mature experience, patience, and tranquillity of mind, when this took place through an immediate interposition of God. While he was feeding his flock on Mount Horeb he saw a bush on fire, and after wondering why the bush was not consumed, he heard the voice of the Lord proceeding from it, who announced himself to him as the God of Abraham, Isaac, and Jacob, and commanded him to lead his people out of Egypt into the land which he had promised to the patriarchs. The name *Jehovah*, by which God declared himself, and commanded that he should in future be known, conveyed the idea of the one everlasting and unchangeable. But not without anxiety, arising from the view of the difficulties which he should meet with, and from his modesty, did he determine to obey this call. Pharaoh he knew to be hard and unbelieving, Moses himself was outlawed, his people rude and incapable of comprehending the idea of the God whom he should announce to them. Being slow of speech, and possessing none of the arts of an orator, his words would not have been believed without visible signs. God therefore gave him power to prove his mission by miracles, and joined to him his elder brother Aaron, a man of little energy, but of considerable eloquence. Thus prepared, Moses became confident that he should succeed with the assistance of God, and returned to Egypt at the age of eighty years to undertake the work. All the difficulties which he had foreseen, and yet greater ones, opposed him. He had the eloquence of Aaron, it is true, to aid him, and the people of Israel must recognize the hand of God in his deeds; but, degraded by long slavery, they wavered between belief and doubt. In vain did he produce changes in the ordinary course of nature which could not be imitated by the art of the Egyptian sages, and for the performance of which a higher power was obviously requisite. The tenth of the destructive plagues which afterwards came upon Egypt—the destruction of all the first-born—first moved the hardened heart of Pharaoh to allow the Hebrews to depart. Moses placed himself at their head, and conveyed them, with all their possessions, out of Egypt, passing through the midst of the Red Sea, in which the faithless Pharaoh, pursuing them, was drowned, with the army which followed him. Yet this deliverance from a formidable enemy was only the beginning of his enterprise. A rude tumultuous people was around him, who until now had obeyed the scourge of their task-masters, but knew not how to live in freedom. Their distress in the desert excited loud murmurs; their meeting with hostile races occasioned bloody combats; the jealousy of the elders produced dissensions and opposition to their leader; his life was even endangered, and he was often obliged to maintain his authority by force and severe punishments. But he remained firm in his post of leader in spite of all opposition. God caused water to flow from the rock of Horeb when struck by his hand, and sent manna to feed the hungry Israelites. In all his ordinances he had the command of God, who wished to draw his people to himself, and to form their hearts by love and fear.

Arrived at Mount Sinai, he allowed the people to encamp, while he himself ascended the holy summit to pray, where, surrounded with thunder, and trembling at the presence of God, the laws were announced to him which were to regulate the lives of the Israelites. Founded upon the faith of the patriarchs, these laws are rather a restoration of the simple truths which had governed the primitive world than a new religion. As presented by Moses they were purified from the errors and follies of superstition which had gathered round them among idolatrous nations, and were exhibited in a form adapted to the wants of the Hebrews, who had grown from a single family to a rude ungoverned multitude. The great object of his legislation is to

inculcate the doctrine that Jehovah is the only God, who will allow no other god besides himself, nor any visible image of his being; that he is himself the king of his people, and that he will rule them by his priests. Hence the laws by which Moses regulates the worship of the Hebrews, the administration of the government and of justice, and even directs their manners, and lays down rules for the care of their health, bear the marks of their heavenly origin. Arising from the wants of the moral and physical nature of man, they were excellently adapted to the peculiar character of the people, to the climate, and to the political position of the land appointed for their dwelling, and to the plan of Providence of making this people the depository of a divine revelation to be developed in the fulness of time, and finally extended over the world. These laws forbid intermixture with other nations, the introduction of foreign customs, and the adoration of strange deities. As a people peculiarly dedicated to God, the Hebrews were to be separated from all neighbouring nations, and to stand separate and independent, relying upon God as their Lord and Master. Regulations extending to the minutest particulars of the daily occurrences of life, in which even the selection and preparation of their food and the care of personal cleanliness were not forgotten, gave them habits adapted to their character and religious destination. A ritual composed of a thousand minute ceremonies, and as a whole allegorically designating a covenant with God, to be incessantly renewed by offerings, prayer, and purification, imposed on them the duty of continual diligence in the service of their heavenly King. To the race of Levi, to which Moses belonged, he assigned the care of the religious service and of seeing that the laws were obeyed, investing, not his sons (whom he allowed to take their place among the common Levites), but the descendants of his brother Aaron, as God commanded, with the first office in the kingdom, that of high-priest. To this tribe, excluded from all property in land, the other tribes were to pay tithes. They were subjected to the authority of elders and judges, and the firmness of their political union was secured by certain festivals to be celebrated by them in common, and by exclusive devotion to the service of God in the tabernacle, a movable temple regarded with awe as the appointed dwelling of Jehovah, into the interior of which the priests alone were allowed to enter, and where, moreover, all the taxes were deposited, so that it was the central point of all the riches of the nation.

These are the chief points in the legislation of Moses, which, even if it displays some Egyptian features, yet plainly manifests the endeavour to wean the Hebrews from Egyptian customs and prejudices, and to elevate them to political and religious independence, and far surpasses, in originality and elevation of principle, in consistency and expressiveness, and, what most proves its heavenly origin, in proofs of true humanity, the boasted legislation of Solon and Lycurgus. Yet its importance was not at once recognized by the Hebrews.

When they were already near the end of their journey towards Canaan Moses saw himself compelled, in consequence of new evidences of discontent, to lead them back into the desert, and forty years of toilsome wandering must be passed there: the severe punishments which the law threatens against transgressors must be executed in all their rigour: all those who had attained to man's estate at their departure from Egypt must die before the law could be thoroughly known, and become habitual with those who had been born during the wandering. Moses himself, distressed with cares, troubles, and occupations of all kinds, was not permitted to live to see the complete accomplishment of his plan on account of a murmur which, in the midst of his distresses, he allowed to escape against his God. After he had appointed Joshua to be the leader of the Hebrews, and had taken a solemn farewell of the people, he ascended a mountain beyond Jordan, from which he surveyed the land of promise, which he could not enter, and closed his eventful life in his 120th year. All superstitious reverence for his bones or his place of sepulture was prevented by the secrecy of his burial, and its effectual concealment from the people. We need not here attempt to determine the extent of his authorship, or the period at which the books which bear his name were put into their present shape. This subject will be more fully treated in the article PENTATEUCH; see also the notices on the five books themselves.

MOSHEIM, JOHANN LORENZ VON, one of the most distinguished German theologians, was born at Lübeck in 1694, studied at Kiel, and in 1719 became a member of the faculty of philosophy there. His reputation as a teacher, writer, and preacher soon procured several flattering offers of promotion, which he declined; but in 1723 he accepted the place of professor of theology at Helmstädt, where he was soon after (1726) made ecclesiastical and consistorial counsellor and abbot of Marienthal and Michaelstein. With these places he also held that of inspector-general of the schools in the Duchy of Wolfenbüttel. In 1747 he was appointed chancellor of the University of Göttingen, where he remained till his death in 1755, lecturing daily on ecclesiastical history and most other departments of theology. Dr. Mosheim was the father of ecclesiastical history. His principal work on this subject is the Institutiones Historiæ Ecclesiasticæ, Libri iv. (Helmstädt, 1755), which was afterwards published under various other forms, and translated into German, with additions; also into English, by Dr. Maclaine. His Sittenlehre der heiligen Schrift (five vols. 1573), continued by Miller (four vols.), is valuable for its completeness and for its practical character. In the department of pulpit eloquence he rendered important services by his Anweisung erbaulich zu predigen, and by his Heilige Reden, and is considered by the Germans the father of sacred eloquence in Germany, and an improver of German didactic prose.

MOSKWA, BATTLE OF THE. See BORODINO.

MOSLEM (Arabic, *muslim*, a true believer; plural, *muslimin*, hence the corrupt form, *musulman*), a general appellation in European languages for all who profess Mohammedanism.

MOSQUE (from the Arabic *mesjid*, or rather the Italian form of that word, *moschea*), a Mohammedan house of prayer. These buildings are constructed in the Moresque or Saracenic style of architecture (see ARCHITECTURE), and display, in unceasing variety, all the peculiarities, both ornamental and unornamental, of that rich and superb style. The mosques of the Arabs often include, in a quadrangular area, an immense quantity of columns ranged in files, the multiplicity and extent of which impress the mind of the beholder with surprise and admiration. These columns are, in numerous instances, the rich spoils of antique monuments. Upon the site (it is said) where formerly stood the famous temple of Solomon, a superb mosque has been erected at Jerusalem. If the Arab temples astonish by their huge extent and prodigious colonnades supporting their arches and vaults, those of the Turks possess another kind of claim to notice and admiration in the grandeur and height of their various cupolas. Every province of Turkey has its own particular style and taste with regard to these religious structures; and as the Moresque architecture

possesses no fixed rules, deeming lightness and elegance alone to be the fundamental laws of the art, the architect is allowed to follow the bent of his own fancy freely. In these Mohammedan churches we find neither altars, nor paintings, nor images, but a great quantity of lamps, of various kinds, which form the principal interior ornament, and some sentences from the Koran written on the white walls. Every mosque has its minaret or minarets (which see). The mosques are quadrangular, and have fountains in the court for ablutions. The entrances are hung with chains in such a manner that no one can enter without stooping. The floor is generally covered with carpets, but there are no seats. In a corner on the south-eastern side is a chair, on which the imám is seated when he reads the prayer. In the direction towards Mecca is a tablet, or recess in the wall, in which are usually some copies of the Koran to direct the worshippers where to turn their eyes—this is called the *kibla*. The finest of the mosques in Constantinople is that of St. Sophia. Usually none but Mohammedans are permitted to enter a mosque; but to this there are exceptions. Pl. CXXXII. shows the interior of the magnificent Mosque El Muayed at Cairo, which was founded in the early part of the 15th century. The imperial mosques have frequently public schools, (*medreseh*), hospitals (*imarets*), and also kitchens for cooking food for the poor. Their income is derived from certain districts and estates, whose inhabitants enjoy great privileges.

MOSQUITO. See GNAT.

MOSQUITO TERRITORY, or MOSQUITIA, an extensive country of Central America, lying on the Caribbean Sea, and forming the eastern seaboard of Nicaragua. Its limits are not well defined, but the area is estimated at 26,000 square miles. The surface is very mountainous on the west, and furnishes the sources of numerous streams. The soil is in general fertile, and covered with a luxuriant tropical vegetation. The interior is said to possess valuable minerals, and the finest tortoise-shell is obtained along the coast. The Mosquito Indians, almost the only inhabitants, are active, bold, and expert in the use of fire-arms. For a considerable period it was governed by a native chief with the title of king, and was under British protection, but by the Treaty of January, 1860, it was made over to the state of Nicaragua. The capital is called Bluefields.

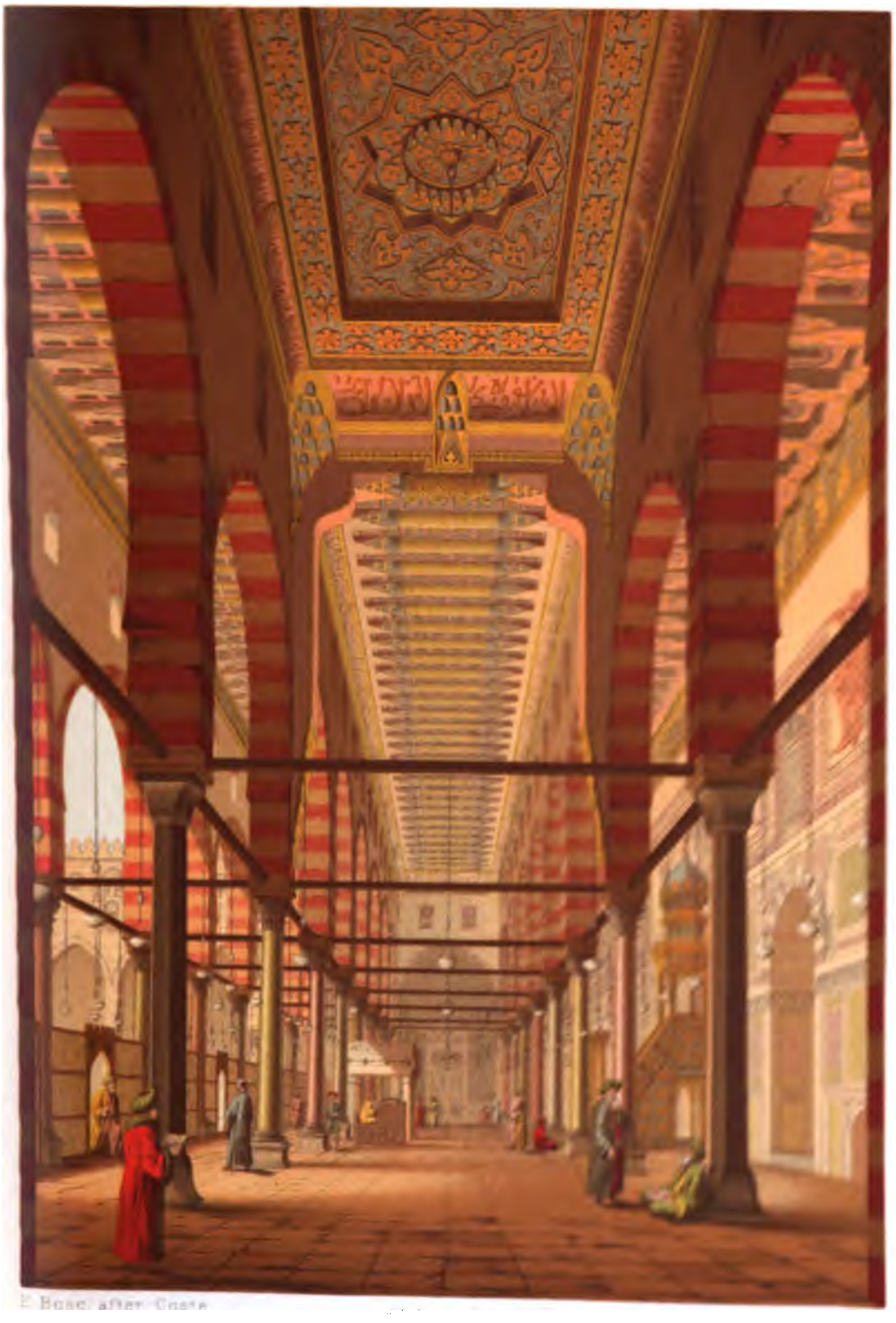
MOSSES (natural order, Musci), cellular plants, erect or creeping, terrestrial or aquatic, having a distinct axis of growth, destitute of a vascular system, and bearing minute imbricated, entire, or serrated leaves. The reproductive organs are of two kinds, viz. 1, *antheridia*, which are axillary cylindrical or fusiform stalked sacs, containing a multitude of spherical or oval particles emitted upon the application of water, and coiled-up bodies which move in water with activity; 2, *pistillidia*, or flask-like bodies, inclosed within a convolute bract, which is eventually carried up upon the point of the spore-case (Lindley). Henfrey, considering the pistillidia of mosses as giving rise to sporangiferous individuals, is of opinion that there is thus a compound organism, in which a new individual, forming a second generation, developed after a process of fertilization, remains attached organically to its parent, from which it differs totally in all anatomical and physiological characters. If this is in reality an alternation of generations, it affords a counterpart in the vegetable kingdom to the remarkable changes undergone during the development of certain of the hydroid polypes, and other animals of the lower ranks. The mosses of Great Britain and Ireland amount to about 441 (Wilson), and the whole species known are about 1250, a number which it may be expected will be greatly extended. Mosses are found in all parts of the world where the atmosphere is humid, but abound chiefly in temperate climates. They are amongst the organic forces which Humboldt observes are ever ready to cover the naked rock with life. Although the lowly moss can scarcely be ranked amongst the plants directly useful to man, it plays an important part in the economy of nature. Mosses are easily dried, and may be preserved for an indefinite period in the herbarium. The cellular tissue of which they consist is highly susceptible to the effect of moisture, and a dried moss dipped in water speedily recovers both its verdure and its form. Mosses are not, as has been supposed, destitute of stomata or breathing pores; in addition to such minute apertures, some are perforated by larger openings, which probably contribute to the same end.

MOSTAR, a town of European Turkey, capital of the province of Herzegovina, on both sides of the Narenta, here crossed by a beautiful Roman bridge of a single arch, 95 feet 3 inches span. It lies in a plain about 6 miles long by 2½ miles broad, and occupies a larger space than is needful: it is surrounded by embattled walls, has generally unpaved streets, a vizier's palace, a number of mosques, and two extensive well-supplied bazaars, and carries on a considerable trade in cattle, corn, wine, fruit, wax, and tallow. Pop. 18,000.

MOSUL, or MOUSSUL, a town of Asiatic Turkey, capital of the eyalet of the same name, 220 miles north-west of Bagdad, on the right bank of the Tigris, here crossed by a stone bridge and a bridge of boats 300 feet long, leading to what has been identified by Layard as the ruins of Nineveh. It rises to a considerable elevation in the middle, and is surrounded by a wall, but is in a state of decay and ruin. The houses are mostly built of sun-dried bricks, and an easily-worked stone resembling marble, found in the vicinity. Its principal ornaments are a college, the tomb of Sheik Abdul Kassin, and the remains of a beautiful mosque, with a fine minaret. The city has declined in commerce, as in everything else, owing, in great measure, to the unsettled state of the surrounding country. Its bazaars are small and inferior in appearance, and its ill-paved and very narrow streets thronged with poor. In point of trade it is chiefly a thoroughfare for the traffic between Bagdad, Syria, and Constantinople. It has, however, considerable commercial intercourse with the interior of Kurdistan. Its principal manufactures are napkins and other cotton stuffs, such as chintz shawls for turbans and calicoes. It was formerly celebrated also for its muslins, hence the name of that description of fabrics, the manufacture of which was carried on to a great extent; but by far the largest quantity of this class of goods now offered for sale in the bazaars is of European make. In the vicinity there are several warm sulphur springs. The city has been repeatedly devastated by famine and plague. On one occasion of this kind, where both were combined, it is said that 100,000 persons were cut off. Pop. estimated at 40,000.

MOTET (from the French) formerly signified a studied composition enriched with all the beauties of the musical art. At present the name of *motet* is given to every composition set to Latin words; such as hymns, psalms, or any small portion of Scripture, in the Roman Catholic Church. In Germany the name is given to figured musical pieces, generally intended only for singing, the subjects of which are passages of the Bible. There are some for four, five, six, and even eight or ten voices. The motets of France and Italy are always accompanied by instrumental music. The subjects are also passages of the Bible, generally in rhymed Latin verses, whilst the

MOSQUE.



INTERIOR OF THE MOSQUE EL MUAYED, CAIRO.

words of the German *motet* are in prose. The German *motet* is chiefly confined to the Protestant part of Germany. The two Bachs may be said to have carried the German *motet* to its highest point.

MOTH, the type of a group of Lepidopterous Insects, included in that order under the collective name of *Nocturnal* Lepidoptera, from their general habit of flying abroad at twilight (*Crepuscular* Lepidoptera) or during night. The moth group includes a large number of genera and species, but in modern entomology various characters are given of the two groups (*Nocturna* and *Crepuscularia*) into which, as above stated, the section may be divided. The Crepuscular forms possess antennæ of a spindle or fusiform shape. The wings are nearly horizontal, or are never much inclined when folded; and the posterior wings have their anterior or front borders provided with a spinous process or *retinaculum;* this process fitting into a hook or depression on the lower surface of the front pair of wings. The *pupæ* or chrysalides are not angular. The Nocturnal moths possess 'setaceous' antennæ, which decrease in size from the base to the apex or point; and these structures may be furnished with lateral processes, when they become 'pectinate' or comb-like; or they may be provided with simple toothed processes, and are then termed 'serrate.' The wings, when at rest, are placed horizontally, or they may be deflexed. A *retinaculum* is present, as in the posterior wings of the Crepuscularia. The pupæ may or may not be inclosed in a cocoon, and may present a smooth or a spiny skin. The *retinacula* or spiny processes of the hinder wings possess the function of keeping the two wings of each side connected during the insect's flight. Amongst the more notable of the groups into which the moth division is classified that of the *Pterophorina*, the 'Feather' or 'Plume-moths,' may be first mentioned. The wings in this group are divided into a number of radiating segments, which are provided on each side with delicate hairs—each segment of the wing thus resembling a minute feather. The body is of small size; the antennæ are delicate and elongated. The legs are of large size, and the shins are provided with spurs or bristles. When at rest the wings are folded to the sides after the fashion of fans. The degree of division of the wings varies throughout this tribe of moths, in some the wings being only partially cut into segments. Included in this tribe are the genera *Pterophorus*, with the anterior wings divided in part only, whilst the hinder wings exhibit a threefold or tripartite division; and *Alucita*, with entire division of the wings. The *Tineina* include the well-known *Tinea sarcitella* or 'Clothes-moth,' the *T. granella* or 'Corn-moth,' and the *Galleria* of bee-hives, whilst other species (*T. pellionella*, &c.) attack furs and natural history specimens. The coloration of the body in this tribe is generally brilliant. The antennæ are slender or bristle-like, and are generally longer than the body. The wings are narrow, elongated, and are fringed. The labial palpi are of large size. The caterpillars or larvæ of Tineina possess eight or ten fleshy prolegs in addition to the six legs which represent those of the future and perfect insect; and they generally form a protecting or pupa case out of the substance amid which they live. Thus the vegetable-feeding species burrow in the leaves and tissues of plants, whilst others, such as the 'Clothes-moth' Caterpillar, construct a protecting envelope out of the fibres of the cloth, this process resulting in the destruction of the material. Encased in this cocoon, with the head protruding, the moth passes its pupa state, and moves about, carrying the case along with it. When from increase in size the case becomes too small the larva adds to it at either end, by placing additional fibres of cloth over the under layer of silky material furnished by the larva itself. The different additions made to the case may be demonstrated by the different colours of cloth from which the case may be constructed. The *Tinea sarcitella* remains quiescent about three weeks in the pupa state and then emerges as the imago or perfect moth, which is of a silvery-gray colour, and which produces the eggs from which a fresh generation of caterpillars are in turn produced. Camphor, tobacco, turpentine, and other materials are used to destroy or prevent the inroads of these well-known domestic pests. *Unwashed* wool, from its still possessing the natural odour or oil, is not subject to the attack of these moths. The members of the third tribe, that of the *Tortricina* or Leaf-rollers, possess short, bristle-like feelers, and triangular expanded wings. The larvæ possess sixteen legs, and living in leaves and plants, roll the leaf-tissues up to form pupa-cases, from which circumstance the familiar name of the group is derived. The *Tortrix viridana* is a familiar species. The *Pyralis vitis* or 'Vine-pest,' the *P. farinalis*, infesting flour and meal, and the *Aglossa pinguinalis*, the larvæ of which are found in butter, grease, and similar substances, exemplify the fourth tribe, that of the *Pyralidina*. The antennæ in this group are short, bristle-like, and in the males are sometimes pectinate. The labial palpi are large, as also are the maxillary palps. The legs are elongated; and the wings are large and of triangular shape. The larvæ possess fourteen legs, and, as in the case of the 'Vine-pest,' are exceedingly destructive to leaves. The *Geometrina* possess bristle-like feelers in the females and feather-like antennæ in the males. There are large wings, but the body is of small size. The caterpillars of this tribe gain the popular name of 'loopers,' from the presence of four fleshy 'false' or 'pro-legs,' situated at the hinder extremity of the body; and from the consequent mode of progression—which is thus of a leech-like character, the body being fixed by the fore or true legs, and the hinder part being approximated to the fixed portion by the pro-legs—a 'looped' appearance is thus presented by the body. It then extends the front portion of the body, and then approximates the hinder portion as before, and in this manner advances. The caterpillar of the 'Magpie Moth' (*Abraxas grossulariata*), which is exceedingly destructive to the leaves of gooseberry bushes, exemplifies this group. The *Nocturna*, or true 'night-moths,' present sombre tints of body, and may attain a large size. The feelers are filiform in shape, and longer than the head and chest. The front pair of wings is longer, but of narrower dimensions than the hinder pair. The latter are partly folded when at rest. The larvæ possess sixteen legs. Of this group the *Catocalæ*, *Triphænæ*, and *Plusiæ* are good examples, these genera exhibiting brighter colours than the other members of the tribe. The *Bombycina* include the famous 'Silk-moth' (*Bombyx mori*) and other species of the genus (for example, *Bombyx Cynthia*, the Arrindy Silk-moth of China and India; the *B. ricini* of Bengal; the *B. Peryni* of Northern China; the *B. Yama-Mai* of Japan; *B. polyphemus*, &c.) The members of this tribe possess short feelers of plumose or pectinate form. The wings are of large size, the hinder pair being broader than the front members. The body is stunted and short. Many of the Bombycina are of very large size. The cocoons are generally spun from the silk gland of the caterpillars, and in the commercial species furnish the valuable silk material. Other forms classified in this group are the *Saturnia Prometheus* of North America; the Oak-lappet Moth of Britain (*Gastropacha quercifolia*), with its processionary caterpillars; the Goat-moth (*Cossus ligniperda*); and the

family *Psychidæ*, including moths of small size, the larvæ of which form cases like those of the Tineina. The last tribe is that of the *Sphingina*, or Hawk-moths. These moths possess thickened antennæ, terminating in an acute point, with pectinate inner margins. The wings are elongated and of narrow form. The proboscis is well developed. The *Sphinx* forms the typical genus, and this name has been derived from the attitude presented by the larvæ of these forms when at rest, having some resemblance to the mythical 'sphinx,' the head and front part of the body being raised and protruded. The Death's-head Moth (*Acherontia Atropos*) and the Elephant Hawk-moth (*Deilephila Elpenor*) are two familiar species included in this tribe; and the *Sesia tipuliformis* affords an example, along with the families *Castniidæ* and *Uraniidæ*, of forms which exhibit connecting links between the Moths and the Butterflies.

MOTHER OF PEARL, or NACRE, the term applied to the inner, shining layer of calcareous or liny material which coats the interior of shells. This layer is secreted by the inner aspect and general surface of the 'mantle' (which see) of Mollusca. It is destitute of colouring matter, but is composed of a series of minute layers or ridges which slightly overlap each other in an imbricated manner. These ridges have the power of arresting and decomposing the rays of light, and of thus producing the beautiful iridescent hues which are so familiar in the nacre. The thinner the ridges the more beautiful are the hues, since when the layers are thick they have little or no power of decomposing light, and, as in the case of the oyster, simply produce a general dullish white tint. Commercially viewed, nacre forms a valuable animal product, which, from its being susceptible of ready division into layers, and from its retaining its brilliant hues, is largely used in decorative art, such as inlaid work, knife handles, and other fancy articles. In *papier maché* work nacre is extensively employed, trays and similar articles being decorated with this material. Pearls (which see) are detached portions of nacreous substance, secreted generally through abnormal action of the mantle-glands. The 'ear-shells' (*Haliotidæ*), and allied forms, are most extensively sought after to supply the nacreous material.

MOTHERWELL, a town in Scotland, in the county of Lanark, 12 miles south-east of Glasgow. It is of comparatively recent origin, and takes its names from three farms called respectively High, Low, and North Motherwell, which again derived their names from an adjoining spring, which in Roman Catholic times was dedicated to the Virgin Mary, and called the *Well of our Lady*, or *Mother's-well*. The inhabitants are chiefly employed in the coal mines, iron and steel works, foundries, and engineering shops. Motherwell contains nine places of worship, and is a station and junction on the Caledonian Railway. Pop. in 1871, 6913; in 1881, 12,904.

MOTHERWELL, WILLIAM, a Scottish poet and antiquary, was born in Glasgow in 1797. His first school experience was gained in Edinburgh, where he had for classmate the Jeanie Morrison he afterwards celebrated in song. He afterwards was sent to an uncle in Paisley, and finished his education at the grammar-school of that place. While a youth he was employed for nearly two years by Dr. Watt in assisting in the compilation of the Bibliotheca Britannica. His labours on the Bibliotheca were limited to that portion of the work which comprehends the books and printers of the fifteenth and sixteenth centuries—an employment highly congenial to his tastes, and which was serviceable to him in after life. At the age of fifteen he obtained a situation in the sheriff clerk's office in Paisley, where he remained about ten years, during which time he attended one or two sessions at the Glasgow College. Among his earlier literary efforts were several contributions to The Visitor, a periodical published at Greenock, and to the Harp of Renfrewshire, a collection of songs with notes, the editing of which he chiefly superintended. He afterwards employed himself busily in the compilation of an interesting collection of ballads, which he published in 1827, under the title of Minstrelsy: Ancient and Modern, illustrated by a historical introduction and notes. The ancient ballads in this collection were principally collected in the western counties of Scotland; the modern ones were chiefly his own. In 1828 he became editor of the Paisley Advertiser newspaper, and after having conducted that journal for about two years he was offered the editorship of the Glasgow Courier, which he accepted, and continued to direct it to the time of his death. He now in a great measure abandoned literature for politics, and the continued excitement consequent on conducting a tri-weekly newspaper—and Motherwell was a violent partisan writer—proved injurious to his health. He died of apoplexy on the 1st of November, 1835, and was buried in the Necropolis of Glasgow, where an elegant monument has since been erected to his memory. Two years before his death he published a collected edition of his poems, which was most favourably received. Most of his pieces are distinguished either by a spirit of warlike enthusiasm or of melting tenderness—and in either strain he is equally successful. Of the former, The Sword Song of Thornstein Raudi may be adduced as an example; of the latter, his well-known Jeanie Morrison, or what is perhaps still more exquisitely pathetic, his ballad beginning, My head is like to rend, Willie.—Motherwell left unfinished the greater portion of an intended prose work, embodying the old wild legends of the Norsemen.

MOTHERWORT (*Leonurus cardiaca*), a labiate plant, with rigid branched stem 3 feet high, flowers in crowded whorls, white with a reddish tinge, upper lip of corolla shaggy, calyx with pungent spreading teeth; leaves petiolate, lower ones palmately cleft, upper ones three-lobed. The plant frequents waste places in some parts of England, and is not uncommon in North America, where it has been introduced from Europe. An infusion of it was formerly much employed in chest diseases.

MOTION, change of position. The science of motion is a department of pure mathematics called *kinematics*. (See MECHANICS.) Position in space is defined by a geometrical point, and the path of the motion of a point is a line. We have no idea of absolute position in space, and hence motion is always relative. When we speak of the absolute motion of a point, it is understood that the motion of the point is considered relatively to certain positions in space regarded as fixed. Thus the motion of a small body in the solar system is always regarded relatively to the plane of the ecliptic, and a certain line in this plane; but the ecliptic is itself moving relatively to the so-called fixed stars. The motion of a point at any place on the earth may be defined by means of three components, that is, by means of its upward, eastward, and northward motions. In this definition we employ an axiom called the *parallelogram of velocities*, which is, that if AC is the diagonal of a parallelogram ABCD, then the motion of a point along AC, during a very short period of time, may be regarded as the sum of two motions of the point along the sides AB and AD during the same period of time. This axiom is the foundation of the science of 'quaternions.'

When the absolute motions of a number of points are known, we can find their motions relatively to any one of the points, or conversely, knowing the

actual motion of one point and the motion relative to it of a number of other points, we can find all their absolute motions in space. The kinematic principle which enables such problems to be solved is: If the velocity of any point of a system be reversed in direction, and be communicated to each point of the system in composition with that which it already possesses, the relative motions of all about the first, thus reduced to rest, will be the same as their relative motions about it when all were in motion. A consequence of this principle is, that if A and B be any two points having any absolute motions whatever, the relative motion of A with respect to B is exactly the same as the relative motion of B with respect to A, and these motions are similar (the radii vectores are changed in a constant ratio, but the angular velocities are the same) to the relative motion of A or of B with regard to any point G which keeps in the line AB in such a position that the ratio AG : GB always remains the same. Linear velocity is defined in the article MECHANICS. The angular velocity of one point P about another point O, when P always moves in the same plane, is the rate at which the angle POA changes with the time, OA being a fixed line in the plane. The angular velocity of a point P about an axis OX is the rate at which the angle, between the plane OPX and any fixed plane through the axis, varies with the time. The rate of change of velocity, linear or angular, with time, is called the 'acceleration.'

In treating of the motion of a body of finite size, we must often suppose it to be rigid; a rigid body is a collection of material particles connected together by invariable geometrical relations; in such a body when the absolute motions in space of any three points not in the same straight line are known, the motion of any other point in the body may be determined. If a body be in motion in any manner one point in it, O, remaining fixed, there is at every instant a straight line OC, every point in which is motionless, and about which at that instant the body rotates; OC is called the 'instantaneous axis' at the particular time. Rotation round an axis during a very short time may be supposed to be made up of three separate rotations during the same short time, about three fixed axes of reference, and it is found that if distances on these three axes represent the amounts of rotation, the composition of rotations is performed in exactly the same way as the composition of forces in statics. Following up this analogy it is found that whilst all theorems in statics are founded on the laws—1. The parallelogram of forces and the parallelogram of couples. 2. A force P is equivalent to any equal and parallel force together with a couple Pa, where a is the distance between the forces; all theorems relating to the motion of a rigid body are founded on the laws—1. The parallelogram of angular velocities and the parallelogram of linear velocities. 2. An angular velocity ω about any axis is equivalent to an equal angular velocity about a parallel axis, together with a motion of translation (whereby every particle in the body is moved parallel to the direction of motion of any assumed point rigidly connected with the body, and with the same velocity) with a linear velocity ωa, where a is the distance between the parallel axes. Hence every proposition in statics relating to forces has a corresponding proposition in kinematics relating to the motion of a body, and these two may be proved in the same way. Corresponding to a well-known proposition in statics is the kinematic one;—every motion of a rigid body may be represented by a combination of two, a motion of rotation of the rigid body about some axis and a motion of translation; in its simplest form this combination becomes a motion of rotation about a certain line called the 'central axis,' and a translation along the central axis. If a plane figure has no motion at right angles to its plane, any other small motion not a pure translation is a rotation about some point in the plane, and it is easy to show that its motion for a finite period of time may be represented by the rolling of a curve in the plane on some fixed curve. Hence when the motions of all the points of a rigid body are in parallel planes, the motion of the body may be represented by the rolling of a certain cylindric surface attached to the body on a fixed cylindric surface.

In investigating the motion of a rigid body it is necessary to know the positions of its principal axes (see MOMENT OF INERTIA) and its principal moments of inertia. If from any point of a body lines are drawn in the directions of the axes of greatest and least moment, and another—the axis of mean moment—be drawn at right angles to these, and if the lengths of the axes represent the amounts of the moments of inertia of the body with regard to them, the ellipsoid of which these are the principal semi-axes is called the momental ellipsoid of the body at the point. If a rigid body, one point of which is fixed, is no longer subjected to the action of external forces, a perpendicular from the fixed point on the tangent plane at the point where the instantaneous axis cuts the ellipsoid is found to be fixed in direction and constant in length. This perpendicular has been called the 'invariable line,' and the tangent plane has been called the 'invariable plane.' Thus we have Poinsot's representation of the motion of a rigid body of which one point is fixed. The motion of the momental ellipsoid is such, that its centre being fixed, it always touches a fixed plane; in fact the motion may be represented by supposing the momental ellipsoid to roll on the fixed plane with its centre fixed. If the plane of the impulsive couple which set the body in motion was horizontal, let a horizontal tangential plane be supposed drawn to the momental ellipsoid, and let this plane remain fixed in position; let the ellipsoid roll on this fixed plane, its centre remaining fixed, with an angular velocity which varies as the radius vector to the point of contact, and let it carry the body with it; we now have constructed the motion which the body would have assumed if it had been left to itself after the initial action of the impulsive couple. The points on the ellipsoid which touch the plane form a curve called a 'polhode;' the points of contact of the plane form a curve fixed in space, called a 'herpolhode.' A polhode is a closed curve drawn round the extremity of the axis of greatest or least moment; its projection on a principal plane is always an ellipse. A herpolhode is not in general a closed curve. Readers may refer to Routh's Rigid Dynamics for the proofs of the following:—'If a body be set in rotation about any principal axis at a fixed point, it will continue to rotate about that axis as a permanent axis. But the three principal axes at the fixed point do not possess equal degrees of stability. If any small disturbing cause act on the body the axis of rotation will be moved into a neighbouring polhode. If this polhode be a small nearly circular curve inclosing the original axis of rotation, the instantaneous axis will never deviate far in the body from a straight line fixed in space. In this case the rotation is said to be stable. But if the neighbouring polhode be not nearly circular, the instantaneous axis will deviate far from its original position in the body. In this case a very small disturbance may produce a very great change in the subsequent motion, the rotation is said to be unstable.' If the initial axis of rotation be the axis OB of mean moment, the neighbouring polhodes all have their convexities turned towards B, and the

rotation is in general unstable. 'If the initial axis of rotation be the axis of greatest or least moment, the neighbouring polhodes are ellipses of greater or less eccentricity. If they be nearly circular the rotation will certainly be stable; if very elliptical, the axis will recede far from its initial position, and the rotation may be called unstable. If OC be the axis of initial rotation, the ratio of the squares of the axes of the neighbouring polhode is ultimately $\frac{A\ (A-C)}{B\ (B-C)}$. [It is to be understood that the letters A, B, and C represent the principal moments of inertia, A being the greatest and C the least.] It is therefore necessary for the stability of the rotation that this ratio should not differ much from unity. It is well known that the steadiness or stability of a moving body is much increased by a rapid rotation about a principal axis. The reason of this is evident from what precedes. If the body be set rotating about an axis very near the principal axis of greatest or least moment, both the polhode and herpolhode will generally be very small curves, and the direction of that principal axis of the body will be very nearly fixed in space. If now a small impulse f act on the body, the effect will be to alter slightly the position of the instantaneous axis. It will be moved from one polhode to another very near the former, and thus the angular position of the axis in space will not be much affected. Let Ω be the angular velocity of the body, ω that generated by the impulse, then by the parallelogram of angular velocities the change in the position of the instantaneous axis cannot be greater than $\sin^{-1}\frac{\omega}{\Omega}$ [the angle whose sine is $\frac{\omega}{\Omega}$]. If, therefore, Ω be great, ω must also be great to produce any considerable change in the axis of rotation. But if the body has no initial rotation Ω, the impulse may generate an angular velocity ω about an axis not nearly coincident with a principal axis. Both the polhode and herpolhode may then be large curves, and the instantaneous axis of rotation will move about both in the body and in space. The motion will then appear very unsteady. In this manner, for example, we may explain why in the game of cup and ball spinning the ball about a vertical axis makes it more easy to catch on the spike. Any motion caused by a wrong pull of the string, or by gravity, will not produce so great a change of motion as it would have done if the ball had been initially at rest. The fixed direction of the earth's axis in space is also due to its rotation about its axis of figure. In rifles a rapid rotation is communicated to the bullet about an axis in the direction in which the bullet is moving. It follows from what precedes that the axis of rotation will be nearly unchanged throughout the motion. One consequence is that the resistance of the air acts in a known manner on the bullet, the amount of which may therefore be calculated and allowed for.' See GYROSCOPE.

When a rigid body moves about a fixed point, the invariable line, which is fixed in space, describes a cone relatively to the body; the axes of this 'invariable cone,' as it is called, coincide with the principal axes of the momental ellipsoid. Again, the instantaneous axis describes a cone in the body; this cone cuts the momental ellipsoid in a polhode. Again, the instantaneous axis describes a cone in space; the motion of the body may be represented by supposing the polhode cone to roll on this, the herpolhode cone. The motion may also be represented by the rolling of a fourth cone upon the invariable plane with a proper angular velocity, whilst this plane turns round the invariable line with a certain uniform angular velocity; this fourth cone is called by Poinsot the 'rolling and sliding cone.'

MOTMOT (*Prionites*). These are beautiful birds, about the size of a jay, with a long tail, the two middle feathers of which are destitute of vanes for about an inch at a small distance from their extremity. This conformation was supposed by some naturalists not to have been the production of nature, but to have arisen from a caprice of the bird in tearing away the vanes, as in the young birds these feathers are entire: this supposition, however, is wholly erroneous. They inhabit South America, and are very difficult to keep in a tame state, from their living on certain kinds of insects, which are not easily procured. They are very shy and timid, and if taken when old invariably refuse all kinds of food. They are solitary, never being seen in flocks, and but seldom even in pairs. Their usual places of resort are the depths of large forests, where they may be observed among the lower branches or on the ground. They fly very badly, and hence build their nests in the ground, using the deserted holes of some of the smaller quadrupeds. The nest consists of a few withered blades of grass, on which they deposit two eggs. The principal species are the Blue-headed Motmot (*P. momota*) and the Red-headed (*P. dumbra*).

MOTOR NERVES. See NERVE.

MOTRIL, a town, Spain, Andalusia, about 1 mile from the Mediterranean, and 38 miles S.S.E. of Granada. It is irregularly built, but has several spacious streets and substantial houses. Its port is at Calahonda, about 2 leagues distant, and being the common emporium for the provinces of Granada and Jaen, has a very extensive trade. The chief exports are oil, fruit, wine, brandy, corks, esparto, lead, and antimony. Pop. 16,665.

MOTTO, in heraldry, a word or short phrase, which is carried in a scroll above or under the coat of arms. The use of mottoes is ancient, and as appended to a coat of arms are frequently hereditary in families. Strictly speaking the motto should bear allusion to the achievement; but in modern times the taking of it depends mainly upon the taste or fancy of the bearer. 'Canting heraldry,' or a punning allusion to the family name, has been adopted in the arms of many honourable families; thus the motto of the Vernons, *Ver non semper viret* is a perfect pun, that of the Onslows, *Festina lente*, is of the same kind.

MOUKDEN. See MUKDEN.

MOULD. See FUNGI.

MOULDINGS. See ARCHITECTURE.

MOULINS, a name common in France to numerous places, of which the most important is Moulins-sur-Allier, capital of the department of Allier, in a fertile plain on the river of that name, 164 miles S.S.E. of Paris. It is irregularly but substantially built, and has among its edifices a cathedral, a college, and the remains of a famous old castle. Its chief manufactures are cutlery, hosiery, woollen and cotton covers, ivory articles, cat-gut, &c. Pop. 21,156.

MOULMEIN, MULMEIN, or MAULMAIN, a seaport of British Burmah, in the division of Tenasserim, and chief town of the district of Amherst, at the mouth of the great river Salween or Thanluyn, with the Island of Balu directly opposite. It is about 200 feet above the level of the river, has a good harbour, and a considerable trade. Its chief exports consist of teak, cotton, rice, tobacco, stick-lac, lead, copper, cocoanuts, hides, and live stock. The imports consist mostly of European cotton goods and marine stores. The principal trade is with Calcutta, Madras, Rangoon, and Penang, but a portion has of late years been directed to London. It was founded in 1825 by the British as a military station; but being equally well situated for trade, has become a flourishing seat of commerce. Pop. (1881), 53,107.

MOUND, in heraldry (from *mundus*, the world), a globe, having a cross on the top. Many heraldic eagles, as those of Austria, Russia, Prussia, have in one claw the sceptre, in the other the mound.

MOUNTAIN ASH. See ROWAN.

MOUNTAINS, the greatest elevations of the surface of the earth. Several mountains together, which cover a plain, are called a *group of mountains*; mountains that form a series of several miles in length, a *chain* or *range of mountains*. Single mountains, rising out of a plain country, are seldom met with, except in the case of volcanoes, which occasionally occur too in continuous lines. The cavities between the mountains are termed *valleys*. Mountains are of great importance in the economy of nature from their influence in determining the climate of a country. Thus the amount of rain that falls in any region is largely dependent on the lie and extent of its elevations; inasmuch as when they intercept moist winds the moisture is precipitated on their surface in the form of rain, or above a certain altitude, of snow. Hence it happens that one side of a mountain chain may have a very moist while the other has a very dry climate. This is seen in the case of the Himálayas, for example, the southern slopes of which are well supplied with moisture, while the northern are exceptionally dry. Mountains of a sufficient height are in all latitudes covered all the year round with a mantle of snow from the top down a certain distance. The height at which the snow lies constantly is called the snow-line. It naturally becomes lower and lower from the equator towards the pole. None of the mountains of Britain is high enough to have a snow-line. A considerable amount of attention has been bestowed upon the inquiry into the origin of mountains. Geologists have demonstrated that the chief agents in altering the surface of the globe are denudation, by the action of water, which is continually abrading and carrying to a lower level the exposed surfaces; and an internal force raising and depressing the existing strata, or forcing unstratified rocks to the surface. The sea-coasts are generally the lowest part of a country, which gradually rises, so that the interior of a continent is the highest, and has usually the greatest mountain masses. The chief mountains are connected in extensive chains or systems, all over the surface of the globe, as may be seen by looking at any map of the world. The mightiest mountain systems of the globe are the Himálayas and the Andes, which latter are continued northwards by the mountains of Central America and the Rocky Mountains, and thus extend through the whole continent of America. The highest individual mountain is Mount Everest in the Himálayas, which is 29,002 feet high, or 5½ miles. The heights of the loftiest mountains are inconsiderable in proportion to the great mass of the earth, the spherical form of which is not essentially altered by them; for even the height of Mount Everest is not, to the diameter of the earth, in the proportion of 1 to 1500. The form of mountains is generally conical, that is, gradually tapering from the base upward, and terminating in a more or less pointed peak, but great deviations from this typical form are very common. To give a short description of the general features of a mountain system we may take the Alps, which consist of an enormous collection of different mountains, disposed in several parallel chains. The highest of these chains is in the middle; those which rest on them diminish in height in proportion as they recede from the main branch. The highest ridge consists of steep rocks, which, with the exception of the declivities, are everywhere covered with ice and snow. Between the masses of rocks that crown the highest chain in pyramidal forms are valleys in which the snow, and ice proceeding from the half-melted snow, never thaws, even in summer, because of their high situation. Lower down, on both sides of the main branch, long wide valleys descend, which in summer are decked with a beautiful green, and where their situation is not too high are partly planted with corn and fruit-trees, partly used for pasturage. To these green vales deep and narrow passages descend from the high rocky valleys. These passages are filled with everlasting ice. (See GLACIERS.) Those chains of mountains which border on the main chain present the same appearances, only on a smaller scale; for their tops likewise consist of pointed rocks, separated by such deep and narrow passages, which, even in summer, are covered with ice and snow, and to which succeed verdant valleys. The farther the chains recede from the main range, the more do they diminish in height. Everything bears a milder aspect. The tops of the single mountains are more rounded; the mountains themselves are decked with a beautiful green, and by degrees lose themselves in the plains. Countries covered with high mountains present, in the summer, different climates at different elevations, within a very narrow compass. We may ascend gradually from flourishing and delightful valleys, decorated with corn, fruit-trees, and vines, to pastures covered with odoriferous Alpine plants, and near the declivities with evergreens, and perceive the vegetation diminishing and dwindling as we advance, till at last all organic life ceases, and the cold prevents all further progress. The fact that the air is colder on the mountains than it is in the plains, is to be attributed partly to the reflection of the sun's rays from the surface of the earth in plains, and its consequent accumulation in the lower strata of the atmosphere, but partly also to the greater density of the air, which is susceptible of being warmed in a higher degree than the rarer air of the mountains. That the air on the mountains is purer is certainly true; but that it is healthier also, can be admitted only in regard to a moderate height. At a great height an indescribable oppression, combined with great weakness, seizes upon the whole body—a phenomenon which Saussure attributes to the diminished pressure of the air upon the vessels, and their consequent loss of elasticity. The interior of mountains is known only so far as it has been laid open in tunnels and in working mines. See the articles ALPS, ANDES, CORDILLERAS, HIMÁLAYA, &c.

MOUNTMELLICK, a market town in Ireland, Queen's County, 45 miles W.S.W. of Dublin, almost surrounded by the small river Owenas. It has a neat court-house, a spacious union workhouse, and a constabulary barracks; a magnificent Roman Catholic church, a handsome Methodist chapel, a large Presbyterian church, and a Friends' meeting-house; several schools, and a dispensary; a large brass and iron foundry, and manufactures of frieze and coarse woollen cloths, and candles. Pop. (1881), 3316.

MOURNING. In most nations from the earliest ages it has been the custom of bereaved survivors to testify their grief for the loss of friends or relatives by some external change of dress and deportment. Different nations have employed the same emblems as symbols of the most opposite states of the mind, being governed altogether by their previous habits and associations, so that the signs of mourning are very various. Thus the eastern nations and the Greeks cut off their hair, the Romans allowed the beard and hair to grow, in mourning. Different colours have been adopted as badges of grief; the ancient Egyptians wore yellow; the Ethiopians, gray; the Roman and Spartan women, white, which is still the colour of grief in China, Japan, and Siam; in Turkey, blue

[illegible] white colour, are frequently [illegible] susceptible of domestication [illegible] from the domestic [illegible] readily tamed. The mice, as rats [illegible] feed with the fore-paws, [illegible] in a sitting position. The [illegible] found in America, into which [illegible] accidentally introduced by the early [illegible] to bring forth young are produced [illegible] and the female brings forth several times in the year. In about a fortnight the young are able to shift for themselves, although they are born in a helpless condition.

[illegible] Mouse (*Mus sylvaticus*, Pl. CLXXII.-CLXXIII., fig. 1) of Britain possesses an American [illegible] in the *Mus leucopus*. The *Mus sylvaticus* is the 'Long-tailed' Field Mouse in [illegible] to the Harvest Mouse (*Mus messorius*) and to the *Arvicola agrestis*, which latter is [illegible] designated the 'Short-tailed' species. The Long-tailed Field Mouse belongs to the genus [illegible], which also includes the Water [illegible]. The Field Mouse and Harvest Mouse [illegible] the farmers pests, from the destruction they cause [illegible] stores of grain. The Harvest Mouse is [illegible] the smallest of mammals, and constructs a beautiful and elegant little nest of the blades of grass or corn, entwined round and supported by the stalks of the corn or wheat. These outdoor species hybernate during winter, and lay up an [illegible] store of grain in their nests and burrows. The general colour of the Field Mouse is a dusky brown, with a darker strip along the middle of the back, whilst the tail is of a white colour beneath. Its average length is 3 inches. The Short-tailed Field Mouse, or 'Meadow Mouse,' as it is sometimes termed, is distinguished by the blunted muzzle, by the short ears and comparatively shortened tail, and by the thicker body. The upper portion of the body is of a reddish-brown colour, inclining to gray; the under parts are lighter, or ashy-brown; and the tail and feet are of a dusky-gray colour. The average length of the body is about 4 inches. This species is exceedingly destructive to forests and crops: the New Forest in Hampshire, about 1814, for example, suffered severely from the depredations of these mice. The prolific nature of these animals is counterbalanced by the depredations upon their numbers committed by raptorial birds (such as owls, hawks, &c., and by weasels, stoats, and many other carnivorous mammals. Yet notwithstanding this check to their increase, these forms at stated periods appear to multiply in immense numbers, and thus cause great loss to agriculturists and proprietors of forests. The Dormice (which see) (*Myoxidæ*) are different animals from the true mice; and the Shrew-mice (which see) are included in an entirely separate order of Mammalia — that of the *Insectivora*.

MOUSQUETAIRES DU ROI, under the old French régime, mounted companies of royal guards, splendidly equipped, and composed of gentlemen of noble extraction. One of the companies was called the *mousquetaires gris*, from the colour of their horses being dapple-gray; the other the *mousquetaires noirs*, in which the horses were black. Their arms were a carbine, sword, and pistols. They were instituted by Louis XIII., and served as a school to many of the most distinguished French commanders.

MOUTH, in animals, the superior or anterior opening of the alimentary canal, but in higher animals also associated with the openings of the breathing organs, and with certain apertures (for example, those of the nose and ears) pertaining to the organs of sense. In lower forms no distinct mouth may be special-

ized, and food—as in the *Amœba* and other animalcules—is received into the soft protoplasmic body by any part of its surface. In some comparatively high animals—such as the Tape-worms and allied forms—no mouth exists, and nourishment is performed by the simple imbibition of fluids by the general tissues of the body. The primary function of the mouth is to serve for the reception of food, and in the higher animals the cavity also serves for the part-preparation of the food for the action of the digestive organs. The lips form the external boundaries of the mouth, and generally perform a greater or less share in the act of prehension of food. Associated with the mouth we find the *pharynx* (which see), or upper portion of the alimentary tract, lying behind the mouth. The boundaries of the mouth in the higher animals are constituted laterally and in front by the *alveolar* borders or teeth-ridges of the upper and lower jaws, by the lips, and by the muscular cheeks; whilst superiorly the mouth is limited by the palate and the *velum palati*, or posterior part of the pharynx; and below the tongue forms the floor of the mouth. The mouth may or may not be provided with *teeth;* and in lower forms it may be surrounded externally by tentacles or organs subserving prehension or even respiration, as in the cuttle-fishes, sea-mats, &c. Frequently, as in Insects, Crustaceans, &c., the masticatory apparatus, instead of being contained within the mouth, and instead of consisting of definite structures belonging to the head, is constituted by modified limbs, &c., which are placed *externally* to the cavity itself. Opening into the mouth the ducts of the *salivary glands* are generally found; whilst in Man the tongue, besides aiding in the mastication and preparation of the food, is associated with the production of articulate sounds. Complicated muscles and nerves administer to the functions of the mouth in the higher animals; and every degree of gradation may be observed in the animal world, leading from a mouthless condition of parts to one in which the mouth assumes a high importance in various functions of the animal. A distinct mouth may exist in comparatively high animals without the presence of an opposite or *anal* aperture (for example, Brachiopoda, &c.)

MOVABLES, in Scotch law, the term which denotes personal as contradistinguished from real or heritable property. The latter, in the case of intestacy, or what is equivalent to it, goes to the heir-at-law, while movables go to the next of kin. The term is not confined to furniture, cattle, and goods, but also includes bills of exchange, debts, &c.

MOVING PLANT (*Hedysarum* or *Desmodium gyrans*, natural order Leguminosæ). This plant is a native of India, and is remarkable for the motions of its leaves. The leaf is imparipinnate, and sometimes pinnately-trifoliate; the large odd leaflet becomes more or less horizontal under the influence of light and heat, and is depressed during darkness or cold. Besides the movement of rising and falling, it has also a lateral oscillatory motion, so as to occupy an oblique position relative to the leaf-stalk. The smaller leaflets, of which there are one or two pairs, also exhibit jerking movements, approaching and retiring from each other, and these motions proceed to a limited extent during darkness. Gray describes nineteen species of *Desmodium* and one species placed under the head of *Hedysarum*, in the flora of the United States, without mentioning that any of them exhibit the phenomenon of the Indian species.

MOXA, the name given to a small cone or cylinder, formed of some material which burns easily, and burned on the skin as a substitute for the actual cautery. When used in Great Britain it was usually composed of pitch, cotton, and various other materials; but the Chinese, to whom the mode had long been known, employed for the purpose the leaves of a species of *Artemisia*, which was long supposed to be *A. sinensis* or *A. indica*, but now appears to be a distinct species, with very downy leaves, called *Artemisia moxa* by Decandolle. The use of the moxa was strongly recommended and brought into vogue by some French physicians about the middle of the eighteenth century, but though still supported by more modern advocates, has been generally abandoned.

MOZAMBIQUE, a Portuguese general government on the east coast of South Africa, from which it is separated by the Mozambique Channel. It extends from Cape Delgado (lat. 10° 41′ S.) to Delagoa Bay (lat. 26° S.), and to an uncertain distance into the interior. It includes the districts of Inhambane, Sofala, &c., though the name Mozambique is sometimes restricted to the region stretching from Cape Delgado to the Zambesi. Only a small part is really in Portuguese possession. The area is estimated at about 380,000 square miles. The population is estimated at 300,000, and has been very much diminished through the slave-trade and the attacks of the Kaffirs. The coast is generally low, beset with reefs and small islands, and possessed of very few good harbours. This, together with the sand-banks, shallows, currents, &c., renders navigation at all times dangerous. Much of the coast district is barren or swampy, though here and there fertile cultivated tracks occur. Inland rises a broad plateau, with groups and chains of mountains running mostly parallel to the coast, and nowhere reaching a great height. The climate is excessively hot, and except on the elevated regions, unhealthy. The flora and fauna peculiar to Africa are here found in the greatest richness. Most tropical fruits thrive; cotton succeeds well; and the forests produce valuable woods. Elephants, rhinoceroses, hippopotami, buffaloes, and carnivorous animals of all kinds are abundant. The sea and the rivers are rich in turtles and fish. In language the native population belongs to the great Kaffir family. In physical features the negro type prevails the farther north we travel. The trade is of little consequence. The principal articles are ivory and skins. The capital is the town of Mozambique, which is situated upon a small coral island near the coast. It is the seat of the governor and the chief trading post. It has the governor's palace, three forts, two churches, an hospital, a prison, warehouses, &c. The harbour is secure. Pop. 8522, of whom 7000 are slaves.

MOZAMBIQUE CHANNEL, the passage between the east coast of Africa and the island of Madagascar. Its width at its southern entrance is 530 miles, at its northern nearly 600 miles, and in the centre about 250 miles. Length from north-east to south-west about 1050 miles. In its north part lie the Comoro Islands.

MOZART, Johann Chrysostomus Wolfgang Amadeus, the great German composer, born at Salzburg, 27th January, 1756. At the age of four years his father commenced teaching him some minuets and other small pieces on the harpsichord. He only needed half an hour to play a minuet with perfect correctness and ease. From this period he made rapid progress, and in his fifth year composed little pieces, which he played to his father, who wrote them down. Although he applied himself with energy and activity to all subjects in which he received instruction, music was the occupation which seemed completely to fill his soul. He advanced so rapidly as to surprise even his father, who was constantly with him. A concerto for the harpsichord, which he wrote in his fifth year, perfectly according to the

[illegible] in the Sistine chapel during the performance and at that time kept very secret. He [illegible] that when he sang it in only [illegible] the [illegible] of which had since it in the [illegible] and the whole. In Rome he [illegible] and [illegible] the Golden Spur; in Bologna after [illegible] half an hour, an [illegible] for [illegible] in which he was [illegible] to be [illegible] number and chapelmaster [illegible] Academy. As he had engaged [illegible] to write the next opera for the carnival at Milan he was only able to refuse similar [illegible] from Florence, Naples and Rome. He arrived at Milan at the end of October, 1770, and their [illegible] was in his fourteenth year, his first opera, Mitridate, which was performed December 26, and received more than twenty times in succession. In Venice he received a diploma as member of the Philharmonic Society. This honour, he writes, [illegible] where he was called [illegible]. When Mozart returned to Salzburg, in 1771, he found a letter, in which he was commissioned, in the name of the Empress Maria Theresa, to compose the [illegible] serenata Ascanio in Alba for the [illegible] of the nuptials of the Archduke Ferdinand. He [illegible] this commission, and in August proceeded to Milan for the nuptials, where during the festivities of the marriage Mozart's serenata and an opera [illegible] by Hasse, were both performed alternately. In 1772 he composed, in celebration of the election of the Archbishop of Salzburg, the serenata Il Sogno di Scipione. In the winter of 1772 he composed there his opera Lucio Silla, which was repeated twenty-six times in succession. After having composed a comic opera called La Finta Giardiniera, 1775, two grand masses; one serenata called Il re Pastore; and in Paris, to which he had been invited a second time, a grand symphony for the [illegible] in that city, he went to Vienna in his twenty-fourth year, where he engaged in the service of the emperor. He satisfied the great expectations which were raised by his early genius, and was hailed as the Raphael of musicians. But early as this great genius developed its powers in his own art, he remained a child in all the other relations of life. He never knew how to govern himself; he had no sense of the necessity of domestic order, of the value of money, and of the need of moderation in enjoyment. But this absent, listless man seemed to become of a higher order when seated at the harpsichord. His mind expanded, and his attention was absorbed in the one object for which he was born—the harmony of sound. He preferred to play in the night till early in the morning, if he was not prevented. He usually composed from six or seven in the morning till ten, and almost always in bed; during the rest of the day he would compose no more unless he had something to finish. His appearance was not favourable; he was short, pale, and thin, and his features were not striking. His Idomeneo, Re di Creta, composed 1780, at Munich, and performed there in January, 1781, was far in advance of any previous composition of the kind. Of his Entfuhrung aus dem Serail (his fourteenth opera in the order of time), which was performed at Vienna in 1782, Joseph II. said to the composer, 'This music is too fine for our ears; there are a prodigious number of notes in it.' 'There are as many as are proper,' replied Mozart. The same year he married Constance Weber, daughter of a musician of Mannheim. His next opera, the Nozze di Figaro, met with the highest applause. It was performed during the winter of 1787 at Prague. At the same place Mozart composed, in the same winter, his Don Giovanni, which pleased in Prague even more than

Mozart, who had been made master of the concerts at the court orchestra at Salzburg, commenced a journey to Italy in company with his father. In Rome he undertook to write down, on hearing it, the famous

the Nozze. Nevertheless, this opera on its first representation was not favourably received at Vienna, although Haydn, on this occasion, pronounced Mozart the greatest of all living composers. After having written, in 1790, Cosi fan Tutte, and during the illness which caused his death, 1791, the Zauberflöte, La Clemenza di Tito, and his famous Requiem, he died December 5, 1792, in the thirty-sixth year of his age, according to the opinion of the physician from an accumulation of water on the brain. His instrumental compositions (his beautiful symphonies, his ethereal quartetts, concertos for the piano, sonatas, &c.) will remain a pattern for all nations and all ages. He has equal fame in sacred music, particularly for his grand hymns and masses. His requiem is generally said to have had the following origin:—Count Walseck, who was a stranger to him, came one day and requested him to compose a mass for the death of his wife, for which Mozart was to fix his own price. Mozart required 100, others say 200, ducats, but would not bind himself as to time, wishing to give the work perfection. The visitor paid the price demanded in advance, and promised when the work was finished to give an additional sum, and to call again in the course of some months. During this time Mozart received the commission to compose La Clemenza di Tito for the coronation at Prague, and was on the point of entering the carriage to proceed to Prague, when the visitor reappeared, and reminded him of his promise. Mozart apologized, and promised to attend to the work immediately on his return from Prague. He commenced the mass with an energy and interest which he had never yet felt while composing any of his other pieces, so that his wife felt great anxiety lest the unusual exertion should affect his already declining health; indeed, Mozart, himself with tears in his eyes, acknowledged that he was writing a requiem for himself. His wife prevented him from continuing the work, and would not return him the manuscript till his health was apparently perfectly re-established, and he had repeatedly requested it. Mozart nearly completed the work when he was again oppressed with melancholy; his health daily declined, and his death took place. Immediately on his death the visitor appeared, demanded the piece, and received it unfinished, as it was left. This composition fell into the hands of his scholar, Süssmayer, who presumed to make additions and alterations, particularly adding those instruments to the sanctus which were omitted, and arranged the whole as it is now printed. Mozart's works equally delight the mere amateur and the accomplished musician, notwithstanding the complete novelty of their character. He explored all the sources of the art, and attained the highest degree of perfection by the richness, purity, and depth of his ideas. Mozart left a widow and two sons. The former married a second time, and died in 1826. His eldest son received a post in one of the government offices at Milan; the younger son, born 1792, became a performer and composer on the pianoforte. Holme's Life of Mozart (London, 1845); Jahn's W. A. Mozart (Leipzig, four vols. second edition, 1867), &c.

MTZENSK, a town of Russia, in the government of Orel, and 35 miles N.N.E. of the town of that name, at the confluence of the Mtzena with the Zoucha. It is tolerably well built, has twelve churches and two convents, and a considerable trade. Pop. 14,159.

MUCH WOOLTON, a town of England, in the county of Lancaster, 6 miles south-east from Liverpool. It has a handsome modern church, with a tower and dome, besides several other places of worship. There are extensive quarries in the neighbourhood, giving employment to a considerable number of men. Pop. (1881), 4539.

MUCILAGE, a name applied to the gum of seeds, roots, &c. See GUM.

MUCIUS SCÆVOLA (properly *Caius Mucius Cordus*), the hero of a Roman legend, and reputed ancestor of a family, the Mucii, who distinguished themselves in the later history of the republic. According to the story told by Livy, Caius Mucius, a young patrician (the Mucii in historical times were plebeians), penetrated to the tent of Porsenna, king of Etruria, who was blockading Rome, with the intention of killing him. Porsenna was sitting with his secretary, and Mucius, mistaking the secretary for the king, instantly killed him. The king in his rage ordered him to be burned alive; but Mucius, putting his right hand in a fire, held it there till the king in admiration of his firmness ordered him to be set at liberty. Mucius then told Porsenna that he was only the first chosen by lot of three hundred Roman youths who had undertaken to assassinate him; and Porsenna, alarmed at the danger he incurred, made peace and evacuated the Roman territory. He received the name of Scaevola (left-handed), from the loss of his right hand in the above manner. Dionysius also relates the story, but with fewer poetical circumstances.

MUCOUS MEMBRANE. See MEMBRANE.

MUCUS (from Latin, *mucus*, the secretion of the nose). This term has come to signify, in physiological language, a variety of substances or secretions, which may generally be said to agree in being of a viscid nature, or composed of gelatinous or albuminous matter, secreted in widely different ways, and originating from varying sources. As properly understood the name mucus is applied to the particular secretion of *mucous membranes* (see MEMBRANE), such as those lining the nose, genital tracts, and other portions of the body. It is, however, to be noted, as mentioned in the article MEMBRANE, that a simple membrane, by a complexity of structure, may become a special secreting membrane, or one which is characterized by the manufacture or production of a particular product. Accordingly the mucous membranes which exemplify the mucous secretion in its simplest phase, and apart from any special secretion, are those which exhibit the typical structure already described (see MEMBRANE) as characteristic of such membranes. Thus the mucus of the nose may perhaps be regarded as a typical and simple secretion; whilst the secretions of the stomach, intestines, of the saliva, bladder, &c., exemplify those in which a more intricate process of secretion operates to produce a more complicated product. Mucus thus exists in the form of a clear fluid, suspended in which numerous epithelial scales or cells, derived from the secreting membrane, are suspended. The fluid is viscous in its nature, does not mix with, but sinks in water. It contains from 4½ to 6½ per cent. of solid matter, and its general composition may be summed up by stating that water, chlorides of potash and of soda, lactates of lime and of soda, phosphate of lime, and a special organic constituent termed *mucin*, are the chief substances discovered on analysis. Berzelius gives the following as his analysis of the mucus of the nose:—

Mucus (*mucin*)	5·33
Alcoholic extractive and alkaline lactate	0·30
Chlorides of potass and soda	0·56
Aqueous extractive, traces of albumen, and a phosphate	0·35
Soda, combined with the mucus	0·09
Water	93·37
	100·00

Albumen differs from mucus chiefly in containing sulphur, this last substance being absent from normal mucous secretions. Under abnormal conditions the

composition of mucus alters widely from that given above; and the special secretions of mucous membranes exhibit each a composition characteristic of and peculiar to itself. The general functions and uses of simple mucus appear to be those of lubricating the mucous passages, and of protecting the delicate surfaces from irritation consequent on contact with air or liquids of various kinds.

MUD-FISH. See DIPNOI.

MUDKI, or MOODKEE, a village of the Paniab, 65 miles south-east of Lahore, where, on 18th Dec. 1845, Sir Hugh Gough defeated the Sikhs.

MUEZZIN, in Mohammedan countries the beadle of the mosque, whose duty it is to summon the faithful to prayer at the assigned periods by public proclamation from the minaret. There are five canonical hours of prayer, at dawn, noon, afternoon, sunset, and night.

MUFTI, in the Turkish Empire a religious officer who exercises the functions of an authoritative judge in matters of religion, or of doctrine and discipline. Each town or district of the Turkish Empire has its mufti, who exercises judicial functions which extend to the relations of civil life. He also superintends the performance of religious rites, appoints the officers of, and administers the goods of the church. The decisions of the muftis on questions of law, called *fetas*, do not possess executive force without the approval of the higher authorities; but they constitute the jurisprudence of the empire. Locally he exercises functions analogous to those of a justice of the peace. The muftis are chosen from among the ulemas or doctors of the law, and together with the cadis, and sometimes with ulemas who are not muftis, form various judicial tribunals of various rank and authority. The grand mufti or Sheikh-ul-Islam is the highest officer of the church and the representative of the sultan in spiritual matters. He ranks next to the grand-vizier.

MUGGLETONIANS, a religious sect which sprang up in England in the middle of the seventeenth century, so called from their joint-founder, Ludowick Muggleton, a tailor. He and his associate John Reeve pretended to the character of prophets, and to be the two witnesses mentioned in Revelation. Muggleton, who professed to be the mouth-piece of Reeve, as Aaron was of Moses, was convicted of blasphemy in London in 1676. He published various works, as, The Acts of the Witnesses of the Spirit, &c., a collection of which was made in 1756. He died in 1697.

MUHALITCH, MOHALITZ, or MUALITSCH, a town of Asiatic Turkey, Anatolia, at the confluence of the Susugherli and Edrenos, about 15 miles above their mouth, in the Sea of Marmora, and 35 miles W.N.W. of Brusa. It consists of about 2000 houses; and though possessed of few manufactures, carries on a considerable trade, particularly in silk, which is extensively raised in the surrounding districts. It has also a considerable trade in melons and other vegetables, raised on the east side of the Lake of Apolonia, and transmitted directly by water to the capital. Pop. about 11,000.

MÜHLBERG, a town of Prussian Saxony, on the Elbe, about 33 miles north-west of Dresden. Pop. (1880), 2461. It is celebrated for the battle fought 24th April, 1547, in which Charles V. defeated the princes of the Schmalkaldic League.

MÜHLHAUSEN, a town of Prussian Saxony, in a fertile district on the Unstrut, 29 miles north-west of Erfurt. It has four churches, one of them a fine structure, a gymnasium, and several benevolent institutions. The manufactures are chiefly woollen and linen cloth, leather, and tobacco. Copper and iron are worked in the neighbourhood. The Anabaptist Münzer had his head-quarters here. Pop. (1880), 23,478.

MÜHLHAUSEN (French, *Mulhouse*), a town of Germany, in Elsass-Lothringen, 61 miles S.S.W. of Strasburg, on the railway to Basel. It is divided into the old and the new town, the former on an island formed by the Ill, which is crossed by four bridges. The streets are winding, but tolerably wide and clean, and lined with well-built houses. The principal buildings are the Reformed and Roman Catholic churches, Hôtel de Ville, and college. The new town, south-east of the old, extends from the right bank of the Ill to the Rhone and Rhine Canal, which has here a capacious basin. The streets are spacious and regular. Till the middle of the last century the only manufacture of any consequence in the town was woollen cloth, but the manufacture of cotton prints and muslins has made rapid progress, and Mühlhausen is now an important manufacturing town. Flowered silks, damask, and other linen, hosiery, straw hats, stained paper, starch, parchment, and chemical products, are among the other manufactures. There are also numerous worsted, flax, and cotton-mills, printfields, bleachfields, extensive engine-works, machine-factories, iron and brass foundries, and tanneries. The trade includes corn, wine, brandy, groceries, and raw cotton. Mühlhausen was a free imperial town in 1298. It successively allied itself with Berne, Soleure, and Basel, and in 1515 with the Swiss Confederation; but in 1798 it dissolved its connection with the Confederation, renounced its independence, and became incorporated with France. It was included in the cession of territory to Germany in 1871. Pop. (1880), 63,629.

MÜHLHEIM (am Rhein), a town of Germany, capital of a circle in the government of Cologne, is situated on the Rhine nearly opposite Cologne. It has manufactures of velvet, silk, and leather, several mills, and a considerable carrying trade. It has a high school and a well-frequented weaving-school. Pop. (1880), 20,420.

MÜHLHEIM (an der Ruhr), a town of Germany, 14 miles north of Düsseldorf; has a trade in coal, sandstone, and building material, cotton-spinning and weaving, and cloth-manufactures, iron-foundries, and manufactures of iron-ware, machinery, and glass. Pop. (1880), 22,146.

MUKDEN, MOUKDEN, or FUNGTIEN-FU, a town of China, capital of Manchooria, and of the province of Leao-Tong, or Shinking, on a branch of the Liau, about 500 miles north-east of Peking. It is surrounded by an external wall, about 10 miles in circuit, and has also an inner wall 3 miles in circuit, inclosing the emperor's residence, the government offices, courts, and other buildings connected with them, which are all arranged on a plan similar to those of Peking. In 1631 the Manchoo monarchs made Mukden the seat of government, and succeeding emperors have done much to enlarge and beautify it. Its port, Kinchau, about 45 miles south, near the Gulf of Leao-Tong, in the Yellow Sea, has a considerable trade in cattle, pulse, and drugs.

MULA, a town of Spain, in the province of, and 21 miles west from Murcia. It possesses a fine *paseo* with avenues of elms and poplars; and a beautiful nunnery picturesquely situated. The principal manufacture is earthenware. Pop. 10,597.

MULATTO (Spanish, mixed) is commonly used in American countries to signify the offspring of a white person and a black. Numerous other words are used to indicate various degrees of negro blood, but the only one which has become common in Europe is quadroon, three fourths white and one-fourth black. The term octoroon is also used in the United States; and such names as musto, mustafina, cabre, griffe,

quatsalvi, tressalvi, and many others, are indigenous growths of different European colonies. In Spain the term *mulatto* is often applied to those persons in whom the Moorish blood has been mingled with the Spanish.

MULBERRY (*Morus*), a genus of plants allied to the nettle, and belonging to the natural order Artocarpaceæ, including the bread-fruit and mulberry. The species are trees, bearing alternate, simple, and often lobed leaves, and inconspicuous flowers, which are disposed in catkins. The fruit is edible, consisting of numerous pistilliferous flowers united into a succulent mass. The white mulberry (*M. alba*) is the most interesting of the genus, on account of the leaves being used for food by silkworms. It grows to the height of 40 or 50 feet, with a trunk 2 or more feet in diameter. The leaves are often divided into several lobes. The berries are white, sometimes, however, varying to red, and possess a sweet and insipid taste. It is a native of China, and the Chinese claim the art of rearing silkworms, and manufacturing stuffs, from a very remote period. From China this art was introduced into India and Persia, and was practised there for many ages before it reached Europe. The Greeks became acquainted with silk subsequent to the time of Alexander; and it was not till the end of the republic that the Romans for the first time saw this precious article. For many ages silk bore an enormous price at Rome; but about the middle of the sixth century, during the reign of Justinian, two monks arrived at Constantinople from India, bringing with them the white mulberry and the eggs of the silkworm. From Constantinople the white mulberry was introduced into Greece, and about the year 1130 into Sicily and Italy. The first mulberry that was planted in France was living in 1802, and there still remain some stocks that are apparently of nearly the same age. It is now cultivated and naturalized throughout the south of Europe, and in some of the central parts of that continent. In southern climates the leaves appear to contain a less proportion of water, and more of that substance which causes the worms to produce silk in greater abundance, and of a finer quality. In Greece, Asia Minor, and Persia, it is usual to give to the worms the branches with the leaves attached to them; but in Spain, Italy, and France, the leaves are carefully stripped from the trees, taking care to despoil each tree entirely, otherwise the sap will be unequally attracted. The varieties of this tree are very numerous. The most approved mode of cultivation is from seed, and is practised exclusively in the south of France. A moderately fertile soil is the most suitable.

The Black Mulberry (*M. nigra*) is a tree about as large as the preceding, said to be a native of Persia, but which has been cultivated in Europe from a very remote period. The fruit is blackish purple, sugary, with a slight acidity, and very agreeable. It is, however, in perfection only for a brief space, and that at the time when it can be detached from the tree by a slight shaking of the branches. The Romans, indeed, preferred it to every foreign fruit. This tree often yields a prodigious quantity. The leaves are sometimes substituted for those of the white mulberry for silkworms.

The Red Mulberry (*M. rubra*) is one of the most valuable of American trees, from the properties of the wood. The leaves are large, cordate, entire, or divided into two or three lobes, rough and hairy while young. The fruit is deep red, and of an agreeable sugary flavour, mingled with a slight acidity. It is rather rare in the Atlantic states, but is abundant in the west, on the Ohio and its tributaries, and on the lower parts of the Missouri. It grows to the height of 60 feet and upwards, with a trunk 6 feet in circumference. It is employed in naval architecture at Philadelphia and Baltimore. Some experiments have been instituted in France to ascertain whether the leaves were suitable for silkworms; but the result was unfavourable. A much less quantity was obtained than from worms fed on the white mulberry, and there was a greater mortality.

The Paper Mulberry has now been separated from the genus *Morus*, and placed under an allied one—*Broussonetia*. Its fruit is succulent and insipid. The tree is of a moderate size, bearing leaves which are either simple or divided into lobes, more or less deep, rough above and hairy beneath. It was originally from India and Japan, but is now very commonly cultivated in Europe, and succeeds even in the more northern parts. For a long time the female plant was unknown in Europe, and at the present time it is exceedingly rare in this country. The islanders of the Pacific make a kind of clothing from the bark of this tree in the following manner: Twigs of about an inch in diameter are cut and deprived of their bark, which is divided into stripe, and left to macerate for some time in running water. After the epidermis has been scraped off, and while yet moist, the strips are laid out upon a plank in such a manner that they touch at the edges, and two or three layers of the same are then placed upon them, taking care to preserve an equal thickness throughout. At the end of twenty-four hours the whole mass is adherent, when it is removed to a large, flat, and perfectly smooth table, and is beaten with little wooden clubs till it has attained the requisite thinness. This kind of cloth is easily torn, and requires to be washed and beaten many times before it acquires its full suppleness and whiteness. The natives dye it red and yellow, and also make a similar cloth from the bread-fruit tree, an allied plant; but that from the mulberry is preferred. The paper which is used in Japan and many other countries in the East Indies is made from this plant. For this purpose the annual shoots are cut after the fall of the leaves, tied in bundles, and boiled in water mixed with ashes; after which the bark is stripped off by longitudinal incisions, and deprived of the brown epidermis. The bark of the more tender shoots is separated from the rest, as it furnishes a white paper for writing, while that produced by the remainder is coarse and gray, and serves for wrapping, or similar purposes. The writing-paper is not suitable for quills, and these nations employ hair pencils or the feathers of birds. For printing they make use of wooden blocks; and this, as well as the writing, can only be executed on one side. Silkworms will eat the leaves of this tree indiscriminately, even when mixed with those of the white mulberry. The fustic tree (*Maclura tinctoria*) belongs to an allied genus.

MULCIBER. See VULCAN.

MULDAU. See MOLDAU.

MULE, the hybrid progeny resulting from the sexual union of the mare and the jackass. The head is large and clumsy; the ears long and erect; the mane is short; and the tail thin. The progeny of a she-ass with the stallion was termed *Bardeau* by Buffon, and is an animal of much less value than the more powerful and enduring mule. The head of the latter hybrid is long and thin; the ears resemble those of the horse; the mane is short, but the tail is bushy. The mule is employed as a beast of burden in Spain, Portugal, Italy, in the East, and in Spanish America. It unites the speed of the horse with the dogged perseverance of the ass, and is docile in temper when fairly treated. The mule is of immense value as a mountain-climber, and can progress with sure foot and steady pace over paths and declivities in which

the horse or other animal would stumble or be altogether unable to proceed—and this under loads of very considerable weight. Great attention is paid to the breeding of mules, especially by the Spaniards. Mules, following the general, although not universal rule of hybrids, are usually sterile among themselves—that is, are incapable of producing their hybrid kind. In some cases, however—and such instances are by no means rare—female mules have borne foals by horses, whilst the male mules have been known to impregnate females of the ass and horse species. The limits of hybrid sterility and fertility are not at all easy to determine; and in these cases, as well as in the case of other animals, the researches of Mr. Darwin and allied observers have done much to extend or alter our views regarding the sexual limits of hybrids and species. (See SPECIES.) In classic times mules were employed to draw the equipages of the great, and in modern Spain the coaches of the nobility are drawn by mules. Those of Savoy are particularly large, and may stand from 12 to 16 hands high. In the mountain passes of the Alps and Pyrenees these animals are found invaluable as beasts of burden. The load varies from 4 to even 6 or 8 cwts. The mare from which the mule is bred is believed to influence the hybrid progeny in a much greater degree than the jackass parent. And hence the breeders of mules select the mare mothers with a view to producing particular points in the breed.

MULE, in manufactures, a machine invented by Samuel Crompton in 1779, for producing finer yarn than was spun by the machines previously in use, and which has now nearly superseded the jenny. (See COTTON MANUFACTURE.) For producing threads of the finest kind a process is necessary which is called *stretching*, and which is analogous to that which is performed with carded cotton upon a common spinning-wheel. In this operation portions of yarn several yards long are forcibly stretched in the direction of their length, with a view to elongate and reduce those places in the yarn which have a greater diameter and are less twisted than the other parts, so that the size and twist of the thread may become uniform throughout. To effect the process of stretching the spindles are mounted upon a carriage which is moved back and forwards across the floor, receding when the threads are to be stretched, and returning when they are to be wound up. The yarn produced by *mule-spinning* is more perfect than any other, and is employed in the fabrication of the finest articles. The sewing-thread spun by mules is a combination of two, four, or six constituent threads or *plies*. Cotton threads have been produced of such fineness, that a pound weight would reach 167 miles.

MULL, an island of the Hebrides, considered to belong to Argyleshire, the largest of the Inner Hebrides next to Skye. Its extreme length is 35 miles, and its greatest breadth is 30; superficial area, 301 square miles. It is irregular in shape, and on the west side has a large bight or bay which contains a number of islands, including Ulva and Staffa. Iona lies off its south-west extremity. There are several lakes in it, of which Loch Erisa and Loch Ba are the largest. The island is for the most part rugged and mountainous; and Benmore, the highest mountain, is rather more than 3000 feet above the level of the sea. The land is better adapted for grazing than for tillage, and cattle and sheep as well as horses are reared in large numbers and exported to the mainland. The quantity of arable land is trifling in amount; it is chiefly situated on the shores. The principal village is Tobermory. Between the island and the mainland of Argyleshire, on the north-east, is the Sound of Mull. Pop. (1881), 5229.

MULLEIN. The common mullein (*Verbascum Thapsus*) grows in old fields, road-sides, &c., in barren soil, and is a conspicuous plant. The root is biennial; the stem simple, cylindrical, two or three feet high, and, together with the leaves, is covered with a very thick down. The flowers are yellow, almost sessile, and are disposed in a long cylindrical spike. Its woolly hairs are used for tinder. It is common in Great Britain and in the regions about the Mediterranean.

MÜLLER, FRIEDRICH, usually called *Maler Müller*, or *Müller the Painter*, born at Creuznach, in 1750, published at an early age several collections of etchings (animals, compositions in the Flemish style, pastoral scenes, &c.), which were remarkable for their originality and freedom. In 1776 he went to Rome and studied the works of Michael Angelo, but without much success. Like many of those who imitate that master, in attempting to copy his grandeur he fell into an exaggerated style. As a poet he deserves more credit. At a time when German poetry had degenerated into a mere versified prose, Müller appeared among the great writers who gave a new impulse to German literature. His complete works were published at Heidelberg (1811, three vols.) The principal are Niobe, Faust, and Genevieve. They are characterized by richness of fancy, warmth of passion, and elevated delineation of character, though sometimes wild and disconnected. He died at Rome in 1825.

MÜLLER, JOHANNES VON, a Swiss historian, was born at Schaffhausen, 5th January, 1752. He studied theology at Göttingen, but early devoted himself entirely to the study of history. In 1772 he was appointed professor of Greek at Schaffhausen but resigned the post next year and began to devote himself to the study of Swiss history. After visiting Geneva, Berlin, Cassel, and other places in Germany and Switzerland, and holding various appointments, the elector of Mainz in 1786 appointed him librarian and councillor of state. Although a Protestant he was sent to Rome on an ecclesiastical mission, and at length ennobled by the emperor. In 1792 when Mainz was taken by the French he retired to Vienna, where he was named an aulic councillor, and in 1800 first keeper of the imperial library, but as the anticipation of his becoming a Catholic was not realized he was deprived of his post and prohibited from continuing his History of Switzerland, the work to which he had devoted his leisure. He was received at Berlin, and appointed historiographer to the king, but the occupation of the Prussian capital by the French in 1806 again deprived him of his position. Napoleon, who had conceived a high opinion of him, offered him the post of secretary of state in the new kingdom of Westphalia, which he accepted in 1807, but resigned in the following year for the post of director of public instruction. He died at Cassel 29th May, 1809. His works display the qualities of an accomplished historian, clearness of arrangement, critical examination of evidence, independence of judgment, and excellence of style, in which he resisted the tendency of German writers to the use of long and involved periods. His principal work was his Geschichte der Schweitzerischen Eidgenossenschaft. The first three volumes were published from 1786-95, the fourth appeared in 1805, and the first part of the fifth volume in 1808. A new edition was published at Leipzig in 1826. Another work was Vierundzwanzig Bücher allgemeiner Geschichten, besonders der europäischen Menschheit (Tübingen, 1810). He also wrote in French, Essais historiques (Berlin, 1781).

MÜLLER, JOHN. See REGIOMONTANUS.

MÜLLER, KARL OTFRIED, one of the most zealous, learned, and laborious antiquarians of modern times,

born in 1797, at Brieg, in Silesia, where his father was a field preacher, attended the gymnasium of his native town, and then proceeded first to Breslau and afterwards to Berlin, where, through the influence of Böckh, he was led to devote himself particularly to the life and art of the ancients. After publishing the first result of his investigations in the Ægineticorum Liber (Berlin, 1817), he obtained an appointment in the Magdalenum at Breslau. Here he employed his leisure in an attempt to analyze the whole circle of Greek mythology, and follow it up to its original sources, in order in this way to draw the proper line between true history and allegorical inventions. In 1819 he received a call to Göttingen, to teach the science of antiquity and likewise the archæology of art. In 1819 he studied the treasures of art at Dresden, and with a similar object undertook a journey to France and England in 1822. He afterwards obtained permission to leave his chair and make a tour in Greece. He accordingly set out, and after spending the winter in Italy and visiting Sicily, where he became seriously indisposed, set sail, and seemed to have reached the goal of all his wishes by setting his foot on the Grecian soil. After personally inspecting the remains of ancient Athens and taking a round of the Peloponnesus, he set out for Delphi, and there engaged in excavations which were far beyond his strength. He was accordingly attacked with fever, and died in Athens in 1840. His writings embraced the whole circle of antiquity, and early gave him a European fame. It is impossible to attempt an enumeration of his labours, and may be sufficient here to mention his History of the Literature of Ancient Greece, which he wrote for the Society for the Diffusion of Useful Knowledge.

MÜLLER, PETER ERASMUS, an eminent theologian, historian, and antiquarian, born in 1776 at Copenhagen, after completing his academical course visited some of the most celebrated universities of Germany, travelled in France and Great Britain, and on his return was in 1801, appointed professor of theology in the University of Copenhagen. In 1830 he succeeded Munter as bishop of Zealand, and died in 1834. Among his theological writings are treatises on the doctrines and moral system of Christianity, which possess great ability. Not less numerous or important are his archæological works, which chiefly relate to Scandinavian literature, and have thrown great light upon it. A critical edition of the Danish historian Saxo Grammaticus was left uncompleted at his death. He also possessed great merit as a philologist, and wrote a work on Danish synonyms, which displays great judgment and acuteness.

MÜLLER, WILHELM, a German poet, born at Dessau, 1794, studied at Berlin (1812), where his favourite branches were the historical and philological. The war of 1813 called him from his books, and he was present as a volunteer in the Prussian army at the battles of Lützen, Bautzen, Hanau, and Culm. In 1814 he returned to his studies at Berlin, and cultivated the old German poetry and literature. His early display of talents had induced his father (a mechanic in moderate circumstances) to allow him to follow his own inclinations; and at Berlin he had enjoyed the advantage of the instructions of Böckh, Buttmann, Ruhs, and Uhden. His journey to Italy (1819) produced his ingenious work Rom, Römer, und Römerinnen (Berlin, 1820); and on his return to Germany he became teacher of Latin and Greek in the newly established school at Dessau, where he was also appointed ducal librarian. In 1824 appeared his Gedichte aus den hinterlassenen Papieren eines reisenden Waldhornisten, which displays great poetical merit. His Lieder der Griechen (1821–24) celebrates, with poetic fire, the awakening of an oppressed nation, its struggle and its victory. His Lyrische Spaziergänge (Leipzig, 1827) displays the same truth to nature, freshness, and fire, and the same harmony of language which characterize his other poems. He also contributed many critical papers to several German periodicals and encyclopædias, and in 1826 undertook the joint superintendence of Ersch and Gruber's Encyclopædia. His Homerische Vorschule (1824) is a work of much learning. His Bibliothek deutscher Dichter des 17 Jahrhunderts (ten vols. Leipzig, 1822–27) is a valuable collection of the best lyric poems of that period. He died in 1827. His works were collected in five volumes (Leipzig, 1830). He was the father of Professor Max Müller, well known as a philologist.

MULLET (*Mullus*), a genus of fishes included in the section Acanthopteri of the order Teleostei. The true Acanthopteri (*Acanthopteri veri*), of which subordinate group the mullets form examples, possess spiny rays in the first dorsal fin, and generally the first rays of the other fins are also spiny. The inferior pharyngeal bones are further never ossified together, but are separated and distinct. The mullets are nearly allied to the Percidæ or Perches. The fins of the mullets are present in perfect array, but the 'opercular' bones, or those of the gill-covers, are not provided with spinous processes as in the perches. The 'branchiostegal' membrane, or that closing the gill-chamber, possesses only four rays in the mullets. The scales are large, and are of the 'ctenoid' or 'comb-like' variety. They are easily detached, and do not present very typical examples of this kind of scale. The lower jaw is furnished with two 'cirri' or tentacular processes. The *Mullus barbatus*, or Red Mullet of the Mediterranean Sea, is perhaps the most celebrated species. This species also occurs, though rarely, in British seas. The Roman epicures held this fish in high estimation, and specimens were sometimes sold for their weight in silver. Pliny instances a case in which the sum of about £60 sterling was paid for a single fish of about 3 lbs. weight. Juvenal also records the height to which this luxury attained in his day when he writes, 'Mullum sex millibus emit, Æquantem sane paribus sestertia libris.' And the sybaritic tastes of the classic epicures were also exemplified in the fashion which prevailed of bringing the fishes alive into the banqueting hall, and of watching their expiring agonies, marked by a brilliant succession and display of varying hues and colours. Hortensius, the rival of Cicero, we are told, had a canal of water constructed below the festive table, in which the mullets were allowed to swim, and from which they might be carried to table, and thence to the fire to be cooked and dressed. Apicius invented a mode of drowning or suffocating these fishes in a certain sauce or pickle, which process was said to add highly to their flavour. A similar fashion prevailed of old in England with regard to lampreys, which were drowned in wine previously to being cooked and eaten. This mullet is still esteemed as an article of food, the flesh being white, fat, and nutritious. These fishes are caught both by lines and nets. The roes, known in Italy by the name of *botaryo*, are prepared after a given recipe, and are highly esteemed as delicacies. The striped or common Red Mullet (*M. surmuletus*), common around the British coasts, is a familiar form in our fish markets, and averages about 14 inches in length. The west and south-west coasts of Britain mostly abound in this fish. Its colour is a bright vermilion red, interspersed with three yellow lines; the throat, breast, and under surfaces incline to white. The fin rays are reddish, and the iris of the eye is of a golden colour. The classical mullet already mentioned possesses even more gorgeous tints than the

commoner striped mullet. The mullets generally may be regarded as bottom fishes; and the tentacular cirri of the mouth appear to aid them in the search after food. (Pl. CIII.–CIV. fig. 6.)

MULLINGAR, a market town in Ireland, capital of Westmeath county, beautifully situated on the Brosna, 44 miles W.N.W. of Dublin. It consists of several main streets of considerable extent, with houses for the most part substantially built of stone and slated; and has a beautiful Roman Catholic and various other churches, a court-house, barracks, infirmary, lunatic asylum, the county jail, a market-house, &c. Pop. (1881), 4787.

MULREADY, WILLIAM, R.A., was born at Ennis, Ireland, 1st April, 1786. He became a student of the Royal Academy about 1800. He early selected for his pencil subjects connected with homely life, and showed considerable observation and study in his treatment of them. In 1808 he exhibited the Rattle at the Royal Academy; in 1809, the Music Lesson; and in 1811, the Roadside Inn. From this time he became a regular contributor, and in 1815 his Idle Boys secured his election as an associate of the Academy, while the following year he was elected an academician. Among the most popular of his numerous pictures after this time were the Wolf and the Lamb (1820), Last (1835), the Seven Ages of Shakspere (1838), First Love, and Open your Mouth and Shut your Eyes (1839), Illustrations to Vicar of Wakefield (1840), Choosing the Wedding Gown (1845), Women Bathing and the Bathers (1849), and the Toyseller (1861). In 1848 the Society of Arts inaugurated an annual exhibition of the works of a single living artist with those of Mulready. An exhibition of Etty's works followed in 1849, but no subsequent exhibition took place. The test in Mulready's case served to bring out a regular progress in taste and style throughout a period of more than forty years. A number of Mulready's pictures have become the property of the nation, and are exhibited at South Kensington. He died 7th July, 1863.

MULTAN, or MOOLTAN, an ancient city of the Panjab, 164 miles south-west of Lahore, 4 miles distant from the present bank of the Chenab. It is upwards of 3 miles in circumference, and is surrounded by a dilapidated wall, and overlooked on the north by a fortress of some strength. The houses are built of burned brick, have flat roofs, and sometimes rise to a height of six stories, their loftiness giving a gloomy appearance to the narrow streets. The bazaars are extensive. The principal manufactures are silks and fine cotton fabrics, while coarse cotton cloth is also produced for home consumption. Multan has an extensive foreign trade with the countries west of the Indus, and a large banking business is carried on by its merchants. The fortress already alluded to, built in 1640, on the site of the old city, stands on a mound of earth, and is an irregular figure of six sides, the longest of which, towards the north-west, extends for about 400 yards. It is surrounded by a wall, substantially built of burned brick, about 40 feet high outside. The vicinity is covered with a vast quantity of the ruins of tombs, mosques, and shrines. Many of these have been substantial edifices, and all tend to show the former extent and antiquity of the city. Multan is one of the most ancient cities in India. It was taken by Mahmud of Ghazna in 1005; by Pir Mohammed for Tamerlane in 1398. After many vicissitudes it fell into the hands of the Sikhs, from whom it was taken by the British in 1849. Pop. (1881), 68,674.

MULTIPLE, a number from which another number may be subtracted a number of times, leaving no remainder. Thus 36 is a multiple of 6, or of 3, or of 9 or of 12, &c. When a number is a multiple of two or more numbers it is said to be a common multiple; thus 36 is a common multiple of 6, 9, and 12. To find the 'least common multiple' of several numbers, express them all in terms of their prime factors, the product of the greatest powers of these prime factors is the answer. Thus to find the L.C.M. of 12, 25, and 35, or the least number which may be divided without remainder by each of them. Here $12 = 3 \times 2^2$, $25 = 5^2$, $35 = 5 \times 7$; therefore $3 \times 2^2 \times 5^2 \times 7$, or 2100, is the L.C.M. required. Thus to find the L.C.M. of the algebraic expressions $7\ (x-a)$, $14\ (x^2-a^2)$, and $21\ (x^3-a^3)$, we see that these expressions are $7\ (x-a)$, $7 \times 2\ (x-a)\ (x+a)$, and $7 \times 3\ (x-a)\ (x^2+ax+a^2)$; so that by the above rule the answer is $7 \times 3 \times 2$, or $42\ (x^2-a^2)\ (x^2+ax+a^2)$.

MULTIPLE-POINDING, in Scotch law, is an action by which the right to a fund on which there are several claimants is settled, as, for example, when the trustee of a bankrupt estate claims a fund in the possession of a third party, to which one or more creditors also allege preferential claims. The action is raised ostensibly in the name of the holder of the fund with a view to ascertain to whom he is to pay it, but it may be raised by any claimant with or without the consent of the holder, and any claimant not originally included in the action may, on producing his claim, have it included in it. The holder of the fund, not being a claimant, has no further interest in the action than to avoid the risk of being compelled to make a double payment, having brought into court the fund or subject of the action, which is thence called the fund *in medio*, quits the action, which is abandoned to the claimants. Thus the raiser is entitled to have it determined to whom the fund is payable, in order that he may not be liable to a second payment, and to the expense of bringing the action into court, and the claimant who substantiates his claim in any degree is entitled to an award to that extent in his favour. The judgment of the court may thus either conclude entirely in favour of one claimant, and award the fund unconditionally to him, or it may rank the claims of the parties in an order of preference, according to the contingencies to which they are liable.

MULTIPLIER, sometimes called 'the astatic galvanometer,' an instrument for measuring a current of electricity. The ordinary form is shown in fig. 6, Pl. LXII. A nearly astatic magnetic combination, consisting of two nearly equal and similar magnetized needles, rigidly connected to keep them parallel, with their like poles in opposite directions, is so suspended by means of a long untwisted silk thread (this may be a single fibre, but more usually consists of a number of fibres placed side by side) that the needles are almost perfectly free to move in horizontal planes. The lower needle is surrounded by a coil of wire, through which a current of electricity may be sent; the deflections of the astatic system may be observed on a graduated circular horizontal card placed above the coil of wire, and immediately below the upper needle. The ends of the coil are brought to two binding-screws or brass cups containing mercury, on the wooden base of the instrument; wires belonging to the remaining part of the galvanic circuit are attached to these binding-screws or cups. The base is supported on three levelling-screws, by means of which the suspension of the needles may be adjusted. The point to which the upper end of the thread is attached may be lowered or raised by turning a screw. A glass cover, provided with a hole in the upper part for the adjusting screw, rests upon the wooden base, and protects the instrument from currents of air. The binding-screws and cups are outside the glass cover. The instrument is first placed so that the needles are in a plane parallel to the

winding of the coils (see ELECTROMAGNETISM); wires from the body, whose electrical state is to be examined, are attached to the binding-screws; a deflection of the needles to one side or other of their former position indicates a current in one direction or the opposite in the coil. If the needles were exactly equal in their magnetic moments the earth would have no directive action on the system, and as the torsion of the suspending wire may generally be neglected, the deflection would be 90° for all currents weak or strong (the wire is supposed to be coiled in parallel planes); but the system is never truly astatic, and the earth's directive action causes the tangent of the action of deflection to be proportional to the amount of current. As in all other galvanometers, by increasing the number of windings in the coil, we can increase the deflection due to any specified amount of current; but this increase of sensibility is obtained with an increase of the resistance of the circuit and with a consequent diminution of current, so that the method cannot be employed with advantage when the circuit external to the galvanometer has a small resistance. Thermo-electric batteries (thermo-piles and other arrangements) have small internal resistances, and hence in investigating their electrical conditions it is necessary to employ a multiplier whose coil has only a few turns of thick copper wire; this is often called a 'thermo-multiplier.'

MULTIPLYING-GLASS, an optical toy, consisting of a plano-convex glass, the convex side having a number of flat surfaces. These flat surfaces make different angles with the plane side of the glass, so that the glass is really a combination of a number of prisms. When a candle or other luminous object is viewed through the glass as many separate images are seen as there are flat faces on the convex side, and these images are coloured by dispersion more or less as they approach the margin.

MULTIVALVES, the name given to such shell-fish or molluscous animals as possess shells which consist of more than *two* pieces. The term is merely used with reference to the shell itself, and is not now employed as a term in the classification of the Mollusca. The multivalve molluscs are represented by the family Chitonidæ or Chitons, which are included in the class Gasteropoda of the subkingdom Mollusca. In these forms, which are common round the British coasts, but attain a larger size in warmer latitudes, the shell consists of eight dorsal plates, disposed transversely and slightly overlapping each other. These plates form the 'valves' of the shell, and constitute an efficient protective casing for the animal, which crawls by means of the broad ventral 'foot' characteristic of the Gasteropoda. They adhere to rocks, after the fashion of the limpets, and possess the power of coiling their bodies up when irritated or alarmed. The other varieties of shells, characterized by the *number* of pieces in the shell, are the *univalves* (for example, Snail, Whelk, &c.) and the *bivalves* (Mussel, Oyster, &c.)

MULTURE, in Scotch law, is the grain delivered to the owner or occupier of a mill in return for the grinding of corn. When a mill is erected the proprietors and tenants of particular lands sometimes bind themselves to use it on particular terms. Lands thus restricted to a particular mill are called its *insucken* multures, while those who employ it voluntarily, at such prices as competition may determine, are called *outsucken* multures.

MUM, a malt liquor which derives its name from *Mumme*, a German, who first brewed it. It is of a dark-brown colour, considerable consistency, and a sweetish taste; and is brewed at Brunswick, of two sorts, the one called *single* or *town*, and the other *double* or *ship* mum, the latter being made of sufficient strength to be carried without injury into hot countries. It was formerly exported from Germany in large quantities, but it is now scarcely to be met with out of Brunswick.

MUMMIES (by some derived from the Arabic *momia*, or the Coptic *mum*, bitumen or wax), the dead bodies of the Egyptians, which were preserved by embalming. Owing either to the religious opinions of the Egyptians, or to the nature of the country, which rendered interment inconvenient, or the want of fuel, which rendered burning difficult, they embalmed all their dead, and deposited them in subterranean chambers, or in grottoes excavated in the mountains. An immense number of them have been found in the plain of Saccara, near Memphis—hence called the *plain of the mummies*—consisting not only of human bodies, but of various animals, or heads of animals, bulls, apes, ibises, crocodiles, fish, &c. Numerous caves or grottoes with contents of the same kind are found in the two mountainous ridges which run nearly parallel with the Nile from Cairo to Syene. Some of the most remarkable of these tombs are those in the vicinity of ancient Thebes, in the Libyan Mountains, many of which were examined by Belzoni, and those near Eleithias (described by Hamilton), farther up the river, which, though less splendid than the Theban sepulchres, contain more illustrations of the private life of the Egyptians. The sepulchral chambers are almost entirely covered with fresco paintings and bass-reliefs, and frequently contain statues, vases, &c. Some of them (the royal sepulchres) consist of suites of spacious halls and long galleries of magnificent workmanship. Those of private individuals vary according to the wealth of the deceased, but are often very richly ornamented. Many of these tombs have been ransacked by Arabs for the purpose of plunder, and great numbers of the mummies destroyed for the resin or asphaltum they contain, which is sold to advantage in Cairo. The tombs and mummies are, many of them, two or three thousand years old, and are in part indebted for their preservation to the dryness of the soil and the mildness of the climate. The processes for the preservation of the body were very various. Those of the poorer classes were merely dried by salt or natron, and wrapped up in coarse cloths, and deposited in the catacombs. The bodies of the rich and the great underwent the most complicated operations, and were laboriously adorned with all kinds of ornaments. Embalmers of different ranks and duties extracted the brain through the nostrils, and the entrails through an incision in the side; the body was then shaved, washed, and salted, and after a certain period the process of *embalming* (see EMBALMING), properly speaking, began. The whole body was then steeped in balsam and wrapped up in linen bandages; each finger and toe was separately enveloped, or sometimes sheathed in a gold case, and the nails were often gilded. The bandages were then folded round each of the limbs, and finally round the whole body, to the number of fifteen to twenty thicknesses. The head was the object of particular attention; it was sometimes enveloped in several folds of fine muslin; the first was glued to the skin, and the others to the first; the whole was then coated with a fine plaster. A collar of cylindrical glass beads of different colours is attached to the masks which cover the head, and with it is connected a tunic of the same material. The beads, both in the collar and tunic, are so arranged as to form images of divinities, of the scarabæus, the winged globe, &c. Instead of this the mummy is sometimes contained in a sort of sheath, made of paper or linen, and coated with a layer of plaster, on which are paintings

and gilding. These paintings represent subjects relating to the duties of the soul, its presentation to the different divinities; and a perpendicular hieroglyphical inscription in the centre gives the name of the deceased, and of his relations, his titles, &c. The whole is then placed in the coffin. Those mummies which have been examined present very different appearances. One class has an opening in the left side under the arm-pit, and in another the body is whole. Some of those which have been opened have been dried by vegetable and balsamic substances, others by salt. In the former case aromatic gums or asphaltum were used (the gums, when thrown into the fire, gave out an aromatic odour); in these the teeth and hair are generally preserved, but if exposed to the air they are soon affected. Those prepared with asphalt are of a reddish colour, and are in good preservation. Those dried with saline substances are of a black, hard, smooth appearance. On exposure to the air they attract moisture, and become covered with a saline substance. Those mummies which have no opening are also partly preserved by saline substances, and partly by asphalt. In the latter not only the cavities of the body are filled with it, but the flesh, bones, and every part seem to be penetrated by it; it was probably injected in a hot state. These are the most commonly met with. They are hard, black, and without any disagreeable smell. The whole mummies prepared with salt alone are white and smooth, and resemble parchment. The coffin is usually of sycamore, cedar, or pasteboard; the case is entire, and covered within and without by paintings representing funeral scenes and a great variety of other subjects; the name of the deceased is also repeated on them in hieroglyphic characters. The cover, which is also entire, is ornamented in the same manner, and contains too the countenance of the deceased in relief, painted, and often gilded. The breast is covered with a large collar, a perpendicular inscription occupies the centre, and funeral scenes the sides. The coffin is often inclosed in a second and even third case.

The name of *mummies* is likewise given to human bodies preserved in other ways, either by accident or by some artificial preparations. The Guanches, or aboriginal inhabitants of the Canaries, preserved the bodies of their deceased friends, which have been found in great numbers in the catacombs in Palma, Ferro, Teneriffe, &c. The natives called them *xaxos*. They are dry, light, of a yellow colour and strong odour, and often injured by worms; they are enveloped in goat-skins and inclosed in cases. They are supposed to have been dried in the air after having had the entrails removed; and they were also covered with a sort of aromatic varnish. Humboldt found mummies prepared in a similar manner in Mexico. The Peruvians also had the art of preserving the bodies of their incas. Mummies were formerly used in medicine under the name of *mumia vera*, on account of the balsam they contained, but they have long ceased to be so employed. Natural mummies are frequently found preserved by the dryness of the air. In a vault of the cathedral at Bremen, called the *lead-cellar* (because it was formerly employed for melting lead for conduits and organ-pipes), are bodies in good preservation. In the celebrated monastery of St. Bernard the bodies of travellers who have been buried in the snow are deposited in a chapel, in which there are open windows protected by grates. They are placed in a sitting position, leaning each on another's breast. The cold prevents their putrefaction and gives them time to dry.

MUMPS, the common name of the disease called in scientific language *cynanche parotidea*. It comes on with the usual febrile symptoms, which are soon attended with a swelling of the jaws and neck, sometimes on one side only, but commonly on both. The causes of it are not known with certainty. Children are more subject to it than adults. It seems, sometimes, to be the effect of cold. It is often epidemic, and, according to Cullen, is contagious. In general it runs its course without dangerous symptoms, and hardly requires any remedies; exposure to the cold should be avoided. The mean duration is from ten days to a fortnight.

MÜNCHHAUSEN, KARL FRIEDRICH HIERONYMOUS, FREIHERR VON, was a German officer, born in Hanover in 1720, who served several campaigns against the Turks in the Russian service 1737–39. He was a passionate lover of horses and hounds, of which, and of his adventures among the Turks, he told the most extravagant stories; and his fancy finally so completely got the better of his memory that he really believed his most improbable and impossible fictions, and was very much offended if any doubt was expressed on the subject. In relating these monstrous fictions his eyes would shine and start out of his head, his face became flushed, the sweat rolled down from his forehead, and he used the most violent gestures, as if he were really cutting off the heads of Turks, or fighting the bears and wolves that figure in his stories. He died in 1797. Baron Münchhausen's wonderful stories have formed the foundation for one of the most brilliant and popular works of fancy in modern times. R. E. Raspe, professor of archæology, keeper of the museum at Cassel, a man of considerable erudition as well as ability, having stolen a large number of gems and coins from the museum, decamped to England. He had made the acquaintance of Baron Münchhausen, and in 1785 he published in London, in the English language, Baron Münchhausen's narrative of his marvellous travels and campaigns in Russia. The baron is made to tell his own adventures with such embellishments as the fancy or reading of Raspe suggested. The book went through several editions, which appeared with considerable enlargements, in two years. It was translated into several foreign languages, and almost immediately into German by Bürger, who made additions and embellishments of his own. Münchhausen is said to have been exceedingly offended at its publication, which took place at Göttingen in 1787, and to have threatened proceedings against Bürger. A French translation by Théophile Gautier, fils, illustrated by Doré, was published in 4to in 1862: an English edition, illustrated by Doré, appeared in 1867. The extravagant absurdity of the incidents, and the natural, unassuming air of the narrative, make the Adventures of Baron Münchhausen one of the happiest works of humour of the burlesque kind. A work entitled Deliciæ Academicæ, published at Heilbronn in 1665, contains in an article called Mendacia Ridicula, some of the stories attributed to Münchhausen; others have been traced to the Chronicle of Zuñiga, the fool of Charles V. A very common impression when the book came out in England was that it was written to ridicule Bruce's narrative of his travels.

MÜNDEN, a walled town in Hanover, at the confluence of the Fulda and Werra, which here unite to form the Weser, 14 miles W.S.W. of Göttingen. Its old castle, now used as a magazine, was once the residence of the Guelphic ancestors of the royal family of Great Britain. Münden used to be one of the greatest linen marts of Germany. Pop. 6354.

MUNGO, ST., or KENTIGERN, the patron saint of Glasgow, an early apostle of the Christian faith in Britain, whose history is to a great extent legendary. His mother, St. Theneu, belonged to the royal family of the Cumbrian Britons, and his father is also said

to have been of royal blood. He was a natural child, according to some accounts the fruit of violence offered to his mother, and was born at Culross about 514, and baptized and brought up by St. Serf, the head of a monastery there, whose favourite pupil he became. His name, Kentigern or Cyndeyrn (from *ken* and *tigearna*), means head lord, and it is said that it was exchanged by the brethren of the monastery for *Mungo*, the beloved, on account of the affection they bore him. Another account is that the latter name (originally *myn*, gentle, and *ghu*, beloved, corrupted to Mungo) was afterwards given him by St. David. On leaving Culross Kentigern founded a monastery on the banks of a small stream flowing into the Clyde, subsequently the site of the city of Glasgow. Having some troubles with the king of the Strath-Clyde Britons, he afterwards took refuge with St. David in Wales, and while in this country he founded a religious establishment under a follower named Asaph, which afterwards became the seat of the bishopric of St. Asaph. He returned to Glasgow, where he acquired a character of great sanctity, spending his time for many years in daily recitations of the Psalms and other pious exercises. He died about 601. The city arms of Glasgow are associated with various legends concerning St. Mungo, and the cathedral is supposed to be built on the site of his monastery. The parish of St. Enoch is so called from a corruption of his mother's name. A fragment of a memoir of St. Mungo, composed by desire of Herbert, bishop of Glasgow 1147–64, is printed in the Registrum Episcopatus Glasguensis of Cosmo Innes. A Life, written by Jocelyn of Furness about 1180, is published in Pinkerton's Vitæ Antiquæ Sanctorum Scotiæ. A work entitled The Legends of St. Kentigern was printed in Edinburgh for private circulation in 1872.

MUNGOOSE (*Herpestes griseus*), a species of the genus *Herpestes* or ichneumon (which see), included in the family Viverridæ or Civets of the carnivorous order of mammals. The mungoose is popularly known by the names of the 'Gray' or 'Indian' Ichneumon, and like its more familiar neighbour the ichneumon (*H. Ichneumon*) the mungoose excels as a destroyer of reptiles, and is said to successfully attack and kill the *cobra* of India, one of the most deadly and venomous of the serpent tribe. Although certainly bitten, and that severely in such encounters, the mungoose appears to sustain no evil effects from the serpent's attack; and the natives believe that the animal eats a certain herb as an antidote against the venom of the cobra. The body is elongated, as in most of the civets, and the tail is thick and rounded at its base, but gradually tapers to a point. The mungoose is of smaller size than the ichneumon, and its grayish fur is marked by bands of a darker colour. It is found chiefly in India, and is frequently domesticated, and kept in houses as a pet. In general disposition the mungoose is shy, but gentle and docile.

MUNICH (German, *München*), the capital city of Bavaria. It lies in an extensive but uninteresting plateau, about 1700 feet above sea-level, on the left bank of the Isar. The original nucleus of the town is situated near its centre, and is of a somewhat circular shape. It was at one time surrounded by walls and ditches, and entered by lofty turreted gates. The ditches have been filled up and the walls thrown down, but a few of the gates, with their loopholed and embattled flanking towers, still remain. The part of the town which may still be regarded as Munich proper is traversed by two principal streets, which, by their intersection, divide the town into four principal parts. One of these streets, the Ludwigstrasse, is of great width, lined with splendid buildings, and regularly intersected with squares adorned with statues. It is the aristocratic promenade of Munich. In the old town the houses are generally ancient, irregular both in size and form, and of quaint but not unpicturesque architecture; their fronts crowded with windows, and ornamented with stucco-work or rude fresco paintings, flanked with lantern-like projections or oriel windows at the corners, and surmounted by high roofs, perforated with three or four tiers of small windows. This ancient town, though it contains the government offices, and many public edifices, is surpassed, both in extent and magnificence, by the new town, which has risen up, chiefly to the north and west, with almost unexampled rapidity and splendour, and made Munich, in proportion to its size, one of the finest cities and capitals of Europe. This new town, commenced within the present century, and on a site of the most unattractive nature, being little better than a swampy waste, is already more than twice the size of the old town. It contains many splendid edifices and collections, of which any capital might be proud; and has been built on a regular plan, previously arranged by the government. The public edifices of Munich are so numerous that little more can be done here than to specify the most conspicuous of them. These are the cathedral, founded in 1488, a vast pile, entirely of brick, with two lofty towers, terminating in domes 333 feet high; St. Michael's or the Jesuits' Church (1583), a handsome Italian structure, remarkable for its wide roof unsupported by pillars, and containing a fine monument to the Duke of Leuchtenberg, by Thorwaldsen; the church of the Theatines, another Italian structure, beneath which are the burial vaults of the royal family; the church of St. Louis, a modern building of brick, faced with white marble, decorated externally with statues by Schwanthaler, and internally by the finest frescoes of Cornelius, and lighted by windows of magnificent painted glass; the church of All Saints, less massive and ambitious than the former, but thought to surpass it in elegance; the royal palace, consisting of an old central building of vast extent, but little architectural merit, and two splendid modern wings; the gallery of sculpture, or Glyptothek, a modern edifice of the Ionic order, containing an admirable series of the finest ancient and modern sculptures; the Pinakothek or picture-gallery, another beautiful edifice, possessing the additional merit of being admirably adapted to the end for which it was erected, exhibiting one of the richest collections of pictures in the world to the greatest possible advantage; the Jesuits' College, the buildings of which now furnish accommodation for the museum of natural history, and other cabinets; the university, attended by over 2000 students; three gymnasia, the royal library, of 400,000 works in more than 800,000 volumes, with 22,000 MSS.; the national museum; the theatre, with a lofty Corinthian portico; and the Odeum, a handsome edifice, devoted to musical entertainments. In addition to the public edifices, properly so called, Munich is rich in monuments, which adorn its squares, gardens, and public promenades. Several of these are in the Hofgarten, a large square inclosure near the palace, finely planted, and surrounded by an open and richly ornamented arcade. Munich has an Academy of Sciences, founded by the Elector Maximilian Joseph III. in 1759, endowed by King Maximilian I. in 1807, and reorganized in 1827; an Academy of Arts, originated in 1759, reorganized in 1842; besides other societies for the promotion of science, literature, and the fine arts. The manufactures are numerous, and, in some particular branches, have acquired a high name. Among others may be mentioned mathematical, optical, and surgical instruments; gold and silver lace, jewelry, glass, carriages, bells, musical instruments, iron and

copper ware, leather, and paper; there are also numerous breweries, employed in making a beer which is famous over Germany, and forms a most important branch of trade. Munich is the seat of the high courts of legislature and of law, and of all the more important offices of the state. Munich was founded by Henry, duke of Saxony, in 962. It was taken by Gustavus Adolphus in 1632, by the French under Moreau in 1800, and by Napoleon in October, 1805. The university was transferred from Landshut in 1826, to which it was transferred in 1800 from Ingolstadt. Pop. in 1880, 230,023.

MUNICIPALITY, the district under the jurisdiction of a municipal corporation, or a borough under municipal government. The municipal boroughs of England are now under the Municipal Corporation Act, 5 and 6 William IV. cap. lxxvi., amended by 9 and 10 Vict. cap. xvii., 32 and 33 Vict. cap. lv., and 34 and 35 Vict. cap. lxvii., &c. The general constitution of a borough under these acts is described in our article BOROUGH. The previous rights of existing corporations and of burgesses are reserved by the first of these acts; but the act 9 and 10 Vict. cap. xvii. abolished all restrictions by which any one not a burgess or member of a trading guild was prohibited from using certain trades or occupations, or opening any shop or premises for trade, within a municipal borough. For the constitution of Scotch municipalities see BURGH.

MUNSTER, the south-west province of Ireland, comprising the six counties of Clare, Cork, Kerry, Limerick, Tipperary, and Waterford. Pop. 1,331,115.

MÜNSTER, a town of Prussia, capital of the province of Westphalia, in a wide plain on the Aa, 78 miles N.N.E. of Cologne, with which, and with Hanover, it is connected by railway. It was once fortified, but the fortifications have been converted into promenades. The principal edifices are the cathedral, an ancient Gothic structure; the church of St. Lambert; the town-house, a beautiful specimen of Gothic, with a colonnade running round its lower story, and a fine hall, called the Frieden Saal, because the Peace of Westphalia, in 1648, was signed in it; the exchange, museum, theatre, house of correction, and an old castle, formerly the bishop's palace, and now occupied by the commandant. As capital of the province, it is the seat of provincial law courts and other establishments. It is also the see of a Roman Catholic bishop, and possesses a Roman Catholic high school, with philosophical and theological faculties, a gymnasium, deaf and dumb institution, veterinary school, school of design, normal seminary, and society for the encouragement of domestic history and antiquities. The manufactures consist chiefly of woollen, linen, and cotton goods, machinery, pianos, paper, leather, starch, tobacco, and refined sugar. The trade, which is considerable, includes, besides the above articles of manufacture, corn, wine, beer, bacon hams, &c. Munster was long governed by independent bishops, in whom a warlike was often much more conspicuous than a Christian spirit; but the most memorable events in the history of the town occurred in 1532-35, when it fell into the hands of the fanatics John of Leyden, Bernhard Knipperdolling, and Bernhard Krechting. (See ANABAPTISTS.) Pop. 40,134.

MUNSTER, PEACE OF. See WESTPHALIA (PEACE OF).

MUNTJAC (*Stylocerus*), a genus of the Cervidæ or Deer family, possessing close points of resemblance with the Moschidæ or Musk-deers. These forms are found in India, China, and the Eastern Archipelago. They inhabit the upper valleys, and especially those in the neighbourhood of woods and forests. The antlers are of comparatively small size; and are further remarkable from the fact that the processes of the frontal bone from which the antlers spring are much elongated, and form of themselves straight horn-like appendages, whereas in other deers these processes are mere knobs. As in all the deers the antlers of the muntjacs are shed annually. The upper canine teeth of these animals are of large size, and thus resemble those of the musk-deers. The muntjacs are said to defend themselves with these teeth when hunted or brought to bay. The metatarsus is destitute of the pencil-like groups of hairs seen in other deers; and the glandular structures also found in that situation in the Cervidæ generally are wanting in these animals. All the species, of which there are several, are of small size, and are delicate and symmetrical in their forms. The typical form is the *S. muntjac*.

MÜNZER, THOMAS, a celebrated fanatic, who, at the period of the Reformation, excited violent disturbances in Germany. Different accounts are given of his birth. He is said to have studied at Wittenberg. He preached at Zwickau in 1520, and at Prague in 1521. He promulgated his doctrines at Altstädt in Thuringia in 1523, and excited the people to revolt against the authorities. In Mühlhausen (1524) he gained an entire ascendancy over the populace, deposed the city council and appointed a new one, permitted the pillage of the monasteries and of the houses of the rich, and proclaimed a community of goods. Another fanatic, by the name of Pfeiffer, entered the Eichsfeld with his troop of plundering followers and joined Münzer. This event, and the information that 40,000 peasants had assembled in Franconia, and plundered and burned 150 castles of the nobles, and twenty-three monasteries, inflamed his zeal, he roused his adherents in Frankenhausen, the mountaineers of Mansfeld, and the peasants at Mühlhausen, Langensalza, and Tennstedt, and prepared for the war, promising his followers that he would raise them all to the rank of nobility. Leaving Pfeiffer governor in Mühlhausen, he proceeded, with 300 chosen men, to Frankenhausen, broke off the negotiations which had been opened with the Count of Mansfeld, and rekindled the ardour of the town's people. Frederick the Wise, elector of Saxony, was now dead, and his more energetic successor, John, associated himself with George, duke of Saxony, Philip, landgrave of Hesse, and Henry, duke of Brunswick, and sent a force against the insurgents. Munzer was totally defeated after an obstinate struggle, May 15, 1525, and was taken and executed the same day.

MURAL CIRCLE, an instrument employed in astronomical observatories to measure the zenith distances of stars. It consists of a graduated circle bearing a telescope attached to a stone wall or pier with deep foundations. The telescope is movable in the meridian.

MURAT, JOACHIM, the son of an innkeeper at Cahors, born in 1771, was a man of an elegant person, spirited and active, but distinguished for the most daring courage rather than sagacity and strength of mind, and finally fell a sacrifice to his rashness. When a boy he escaped from the College of Toulouse, where he had been placed to prepare him for the ecclesiastical profession. He was afterwards a common chasseur, and deserted; served in the constitutional guard of Louis XVI.; then entered the 12th Regiment of mounted chasseurs; rose by his zealous Jacobinism to the rank of lieutenant-colonel; was afterwards removed as a terrorist, and remained without employment till his fate placed him in connection with Bonaparte, whom he served as aide-de-camp in Italy in 1796. Here he distinguished himself as a cavalry officer by his impetuous courage. He followed the general to Egypt, where he decided the vic-

tory over the Turks at Aboukir, and returned with Bonaparte as general of division. On the 18th Brumaire (Nov. 9, 1799) he expelled the council of five hundred from the hall of St. Cloud at the point of the bayonet. On 20th January, 1800, he married Marie Annonciade Caroline (born in 1782), the youngest sister of the first consul. He was present at the battle of Marengo, and in 1804 was made marshal of the empire, grand-admiral, and prince of the imperial house. His services in the campaign of 1805 against Austria, in which he entered Vienna at the head of the army, were rewarded in 1806 with the grand-duchy of Cleves and Berg. In the war of 1806 with Prussia, and of 1807 with Russia, he commanded the cavalry, and in 1808 he commanded the French army which occupied Madrid. He anticipated receiving the crown of Spain, Charles IV. having invested him with royal authority; but Napoleon, who destined Spain for his brother Joseph, placed him on the throne of Naples, July 15, 1808. He took the title of *Joachim Napoleon*. In 1809 he made an unsuccessful attempt to conquer Sicily, but he governed his new kingdom with prudence and vigour. His wife, a woman of sense and character, effected much good at home, while Murat himself was called in 1812 to accompany Napoleon to Russia. Upon the retreat Napoleon intrusted to him the command of the wreck of the army on 5th December, 1812; but he resigned it to Prince Eugene, and left the army secretly on 16th January, 1813. He, however, once more fought with Napoleon in the fatal campaign of Germany (1813). After the battle of Leipzig he returned with his army to his kingdom, and negotiated for its preservation with Austria and Britain. The former actually concluded an alliance with him (June 11, 1814), to which Russia and Prussia acceded in 1815; but Britain would only enter into a truce, since Ferdinand of Sicily, her ally, would receive no indemnification for Naples. The situation of Murat was consequently doubtful. He advanced with his army in February, 1814, as far as the Po; but his hesitation in attacking the French excited the mistrust of Britain as much as the hesitation of Britain to acknowledge him as an ally had excited his own suspicions. At the Congress at Vienna the Bourbons solicited for his dethronement, and Britain accused him of treachery. He took up arms in 1815 for Napoleon; but being defeated by Generals Neipperg and Bianchi near Tolentino, 2d and 3d May, he was forced to leave Italy, and took refuge in Toulon, whence he continued to correspond with his partisans. After the overthrow of Napoleon he escaped to Corsica, and on 28th September he set sail for the Neapolitan territory with a view to recover his kingdom. He landed at Pinzo on 8th October, but was immediately captured, tried by a court-martial, and shot on the 13th October, 1815.

MURATORI, Ludovico Antonio, a distinguished Italian antiquarian and historian. He was born at Vignola in the Modenese territories, 21st October, 1672. Having adopted the ecclesiastical profession, and received the order of priesthood, he obtained some preferment in the church. In 1694 he was made keeper of the Ambrosian Library at Milan, and in 1700 librarian and archivist to the Duke of Modena. He died 23d January, 1750. His literary productions are voluminous and valuable, but his fame principally depends on his labours as an editor of the works of others. His works fill forty-six folio, thirty-four quarto, and thirteen octavo volumes. Among them are Della perfetta Poesia Italiana (1706, two vols. 4to); Antichità Estensi (1710–40); Antiquitates Italicæ Medii Ævi (1738–42, six vols. folio); Novus Thesaurus Veterum Inscriptionum (1739, four vols. folio); Anecdota Latina (four vols. 4to); Anecdota Græca (4to); his great collection Rerum Italicarum Scriptores ab Anno 500 ad 1500 (twenty-seven vols. folio, 1723–51). His principal original works are Annali d'Italia dal Principio dell' Era Volgare sino all' anno 1750, published in 1762; and Dissertazioni sopra Antichità Italiane (1751, three vols. 4to). The most recent edition of the works of Muratori is that of Venice (in forty-eight vols. 8vo, 1790–1810). Hallam says, 'Muratori's accuracy is in general almost implicitly to be trusted, and his plain integrity speaks in all his writings; but his mind was not philosophical enough to discriminate the wheat from the chaff, and his habits of life induced him to annex an imaginary importance to the dates of diplomas and other inconsiderable matters. His narrative presents a mere skeleton devoid of juices; and besides its intolerable aridity, it labours under that confusion which a merely chronological arrangement of concurrent and independent events must always produce.'

MURCHISON, Sir Roderick Impey, a distinguished geologist and man of science, was born of an old Scottish family at Tarradale, in Ross-shire, on the 19th of February, 1792. He received the first part of his education at the grammar-school of Durham, and afterwards, intending to adopt the military profession, he joined the military college, Great Marlow. In 1807 he received an ensigncy in the 36th Regiment. He studied at Edinburgh University in 1807–1808, and served in the Peninsular war in 1808–1809. After the conclusion of the Peace of 1815 he retired from the army, married the daughter of General Francis Hugonin, and after spending a few years in travels, determined to devote himself to scientific pursuits, a purpose which he was encouraged to carry out by Sir Humphrey Davy. Ultimately attaching himself to geology as his special study, he spent several years in the investigation of different parts of England, Scotland, and the Continent; and about 1830 undertook a systematic examination of the sedimentary deposits of remote periods, as seen in Herefordshire, Shropshire, and South Wales. In the strata that he examined in South Wales he found such distinct characteristics as to warrant him in regarding them as belonging to a new system. To this system he gave the name of the Silurian, derived from the old British tribe of the Silures, who inhabited this part of Wales; and he first published his views respecting it in 1831 in a communication to the newly formed British Association for the Advancement of Science. His views were further developed in his first great work, entitled The Silurian System (London, 1839); and the publication of this book led to the general adoption of his theory. His labours in England were followed up by similar investigations in the Rhine district; and in 1841 he was invited by the Emperor Nicholas to undertake a geological examination of Russia, which, in spite of the previous labours of Strangways, Pander, Erman, and others, still offered a wide field to the geologist. Twice he travelled over different parts of Russia, the first time in conjunction with Vemenit, and the second time accompanied also by Count Keyserling and Lieutenant Kotsharoff, examining it in all directions, and advancing as far as the Ural Mountains. The results of this examination were published in a treatise On the Geological Structure of the Northern and Central Regions of Russia in Europe (London, 1841); and again, after travelling through several parts of Germany, Poland, and the Carpathian Mountains, and examining the palæozoic formations of Sweden and Norway, more fully in his great work on the Geology of Russia in Europe and the Ural Mountains (two vols. London, 1845). In the course of these investigations he had satisfied

himself that the uppermost series of the palæozoic rocks, formerly known in England as the lower new red sandstone and the magnesian limestone and marl slate, constituted only one natural group, and he now proposed to give it the name of the Permian System, from its extensive development in the ancient kingdom of Permia in Russia. In recognition of his services he received several of the highest honours from different quarters. By the Emperor Nicholas he was made Knight Grand Cross of the orders of St. Stanislaus and St. Anne, and was admitted a member of the Academy of St. Petersburg; and on his return to England her majesty in 1846 conferred upon him the dignity of knighthood. The subsequent life of Sir Roderick was chiefly devoted to the prosecution of his geological studies, although he also gave attention and encouragement to the geographical explorations made in Africa by Speke, Grant, Livingstone, and others. By a comparison of specimens of the rocks of Australia with the auriferous rocks of the Ural Mountians, he was led, so early as 1845, to predict that gold would be found there; and in the following year, six years before that metal was practically worked there, he advised the unemployed Cornish tin-miners to emigrate to Australia and search for gold. In 1831–32, and again in 1842–43, he was elected president of the Geological Society. He was one of the founders and most active members of the British Association for the Advancement of Science, and he presided over the meeting of that association at Southampton in 1846. He was several times elected president of the Royal Geographical Society; after 1862 he was by general consent always re-elected, and he remained president of that society till within a few months of his death, which took place on the 22d of October, 1871. In 1855 he was appointed director-general of the geological survey of Great Britain, and of the Museum of Practical Geology in Jermyn Street. In 1863 her majesty made him a Knight Companion of the Bath, and three years later he was created a baronet. In addition to a popular exposition of his Silurian System in a work entitled Siluria (London, 1853; third edition, 1864), he has made several contributions to the Transactions of the Geological Society, the treatises of the British Association, and other periodical works.

MURCIA, a province of Spain, forming part of the ancient kingdom of same name, and lying on the Mediterranean: area, 5970 square miles; pop. (1883), 459,895. A considerable portion is composed of ranges of hills, producing oaks and pines, and containing mines of copper, iron, lead, and silver, and quarries of marble. There are also extensive plains, which are rendered amazingly fruitful by irrigation. The ancient kingdom was bounded on the north by La Mancha, east by Valencia, south by the Mediterranean, and west by Granada, and included what is now the province of Murcia, the greater part of the province of Albacete, and portions of the provinces of Jaen and Alicante. After passing through the hands of the Romans and Goths, it was conquered by the Moors in 713, and continued under them till 1240, when it became a dependency of Spain.

MURCIA, a city of Spain, capital of the ancient kingdom and modern province of same name, 30 miles N.N.W. of Cartagena, on the Segura, which divides the town into two unequal portions, connected by a handsome bridge of two arches. The city is surrounded by a brick wall, and is entered by three principal gates. The streets are generally broad, straight, and well paved; and the houses, mostly two stories high, are painted in pink and yellow colours: those of the nobility, some of which are lofty and spacious, have pretty gardens attached. Among the public buildings the most important is the cathedral, whose principal façade, a combination of Corinthian and composite architecture, produces a fine effect, while the interior rather disappoints. It was begun in 1353. In the plaza stands the capacious episcopal palace, built in 1752, one of the finest edifices of its class in Spain; and in close proximity to it the colleges of St. Fulgentius and St. Isidore, which form one range of building. The bishop takes his title from Cartagena, from which town the see was transferred. The other public edifices and institutions consist of the college of St. Leander, which is an academy of music connected with the cathedral; the hospital of St. John, with which is connected an hospital for convalescents; a house of refuge, a foundling hospital, the town-house, an institute for advanced education, a school of design, an ecclesiastical seminary, several nunneries, a bull-ring, and a good botanical garden. There are manufactures of coarse cloths and baize of different colours; of silk stuffs, especially taffety and plush; linens, hats, gloves, saltpetre; also silk spinning-mills, dye-works, potteries, tanneries, soap-works, and about thirty flour-mills. Considerable commerce is carried on in raw, spun, and dyed silks, and in some of the other manufactures above mentioned, as well as in grain and fruits. Pop. (including the suburbs), 91,895.

MURE, William, D.C.L., historian, the eldest son of William Mure of Caldwell, an estate on the borders of Renfrewshire and Ayrshire, was born at Caldwell on 9th July, 1799. He was educated at Westminster School, the University of Edinburgh, and the University of Bonn. His studies in the last university developed the taste for antiquarian research on which his reputation is founded. In 1824 and 1825 he contributed to the Edinburgh Review articles on Spanish literature and other subjects. In 1829 he published Brief Remarks on the Chronology of the Egyptian Dynasties, showing the Fallacy of the System laid down by Messrs. Champollion, in Two Letters on the Museum of Turin; in 1832 A Dissertation on the Calendar of the Zodiac of Ancient Egypt; in 1842 Journal of a Tour in Greece and the Ionian Islands, with Remarks on the Recent History, Present State, and Classical Antiquities of those Countries (two vols. 8vo). In 1846 he was elected member of Parliament for Renfrewshire, for which county he continued to sit till 1855, when he resigned in consequence of ill health. In the winter of 1847–48 he was elected lord-rector of the University of Glasgow. He published his inaugural address (Edinburgh, 1848). He held the office of commandant of the Renfrewshire Militia, with the title of colonel, and was a justice of the peace and deputy-lieutenant of the county. He died in London, 1st April, 1860. His leading work, which was left unfinished at his death, A Critical History of the Language and Literature of Ancient Greece, was published in five vols. (1850–57), and a second edition in four vols. 8vo (1859). The greater part of the work as it stands is occupied with the mythical period, and treats of the earlier Greek poets; the fourth and fifth volumes are devoted to the Greek historians Herodotus, Thucydides, Xenophon, and their predecessors. The drama was the subject of the sixth volume, on which the historian was engaged at the time of his death. The work exhibits great learning and ability.

MURIATIC ACID, the older name for hydrochloric acid (which see).

MURILLO, Bartolomeo Esteban, the greatest of all the Spanish painters, was born at Seville, Jan. 1, 1618. He received his first instructions in the art from his relation Juan del Castillo; but the latter having gone to settle at Cadiz, Murillo was obliged

for subsistence to paint banners and small pictures for exportation to America. In that business he obtained full employment, and began to distinguish himself as an able colourist. He was still very young when he happened to see some works of Pedro de Moya, who was passing through Seville on his way to Cadiz, which being painted in the style of Vandyke, inspired him with the desire of imitating that great artist, under whom De Moya had studied shortly before his decease. The time he was able to avail himself of Moya's instruction was very short, and he resolved afterwards to repair to Italy for improvement. But his means were totally inadequate to meet the expenses of such a journey. Collecting, however, all his resources, he bought a quantity of canvas, divided it into a number of squares, upon which he painted subjects of devotion and flowers, and with the produce of the sale of these set out upon his journey unknown to his relations and friends. On his arrival at Madrid he waited upon Velasquez, his countryman, and communicated his plans to him. Struck with the zeal and talents of the young artist, Velasquez treated him with the greatest kindness, and diverted him from his project of the journey to Rome by procuring him full employment at the Escurial, and in the different palaces of Madrid. Murillo returned to Seville in 1645, after an absence of three years. The following year he finished painting the little cloister of St. Francis; and the manner in which he executed it produced the greatest astonishment among his countrymen. His picture of the Death of Santa Clara, and that of St. James Distributing Alms, crowned his reputation. In the first he showed himself a colourist equal to Vandyke, and in the second a rival of Velasquez. They obtained him a multitude of commissions, which procured him an independent fortune. His success, however, never led him to be careless. He gradually perfected his manner by giving more boldness to his pencil, without abandoning that sweetness of colouring which distinguished him from all his rivals, increasing its strength, and giving greater freedom to his touch. He enriched the churches and convents of Seville and other cities with numerous works. Having been invited to Cadiz to paint the grand altar of the Capuchins, he there executed his celebrated picture of the Marriage of St. Catharine. As he was about to finish it he wounded himself so dreadfully on the scaffolding that he continued to feel the effects of the injury until his death at Seville in April, 1682. To the greatest merit as an historical painter Murillo joined equal excellence in flowers and landscape. His works afford proofs of the perfection to which the Spanish school had attained, and the real character of its artists; for, as Murillo never quitted his native country, he could have been comparatively little influenced by any foreign style; and his originality of talent places him in the first rank among the painters of every school. He has neither the charming dignity of Raffaelle, the grandeur of Caracci, nor the grace of Correggio; but, as a faithful imitator of nature, if he is sometimes vulgar and incorrect, he is always true and natural; and the sweetness, brilliancy, freshness, and harmony of his colouring make us forget all his defects. The works of Murillo are numerous. Many of them are preserved in his native town, where, besides those distributed among the churches, convents, and hospitals, and the cathedral, there is a special gallery bearing his name. Among these are several popularly known by engraving. The Seville collections comprise several Madonnas and Conceptions, which were among his favourite subjects, an Adoration of the Shepherds, an Annunciation, an Ecce Homo, an Infant Jesus Asleep, and his celebrated pictures St. Thomas of Villa Nueva Distributing Alms, St. Anthony of Padua, Moses Striking the Rock, and the Miracle of the Loaves and Fishes. At Cadiz is his Marriage of St. Catharine; at the Museum of Madrid are forty-five of his works, nearly all of high value. Among them are the Conversion of St. Paul, and a series of four pictures representing the career of the prodigal son. The Museum of the Louvre has likewise some treasures of Murillo, one of the most famous Conceptions, Jesus on the Mount of Olives, and others. Examples of the master are also to be found in Munich, Dresden, and Vienna. In the National Gallery in London a John the Baptist, a Holy Family, and a Young Beggar. Many of his works are also in the hands of private collectors.

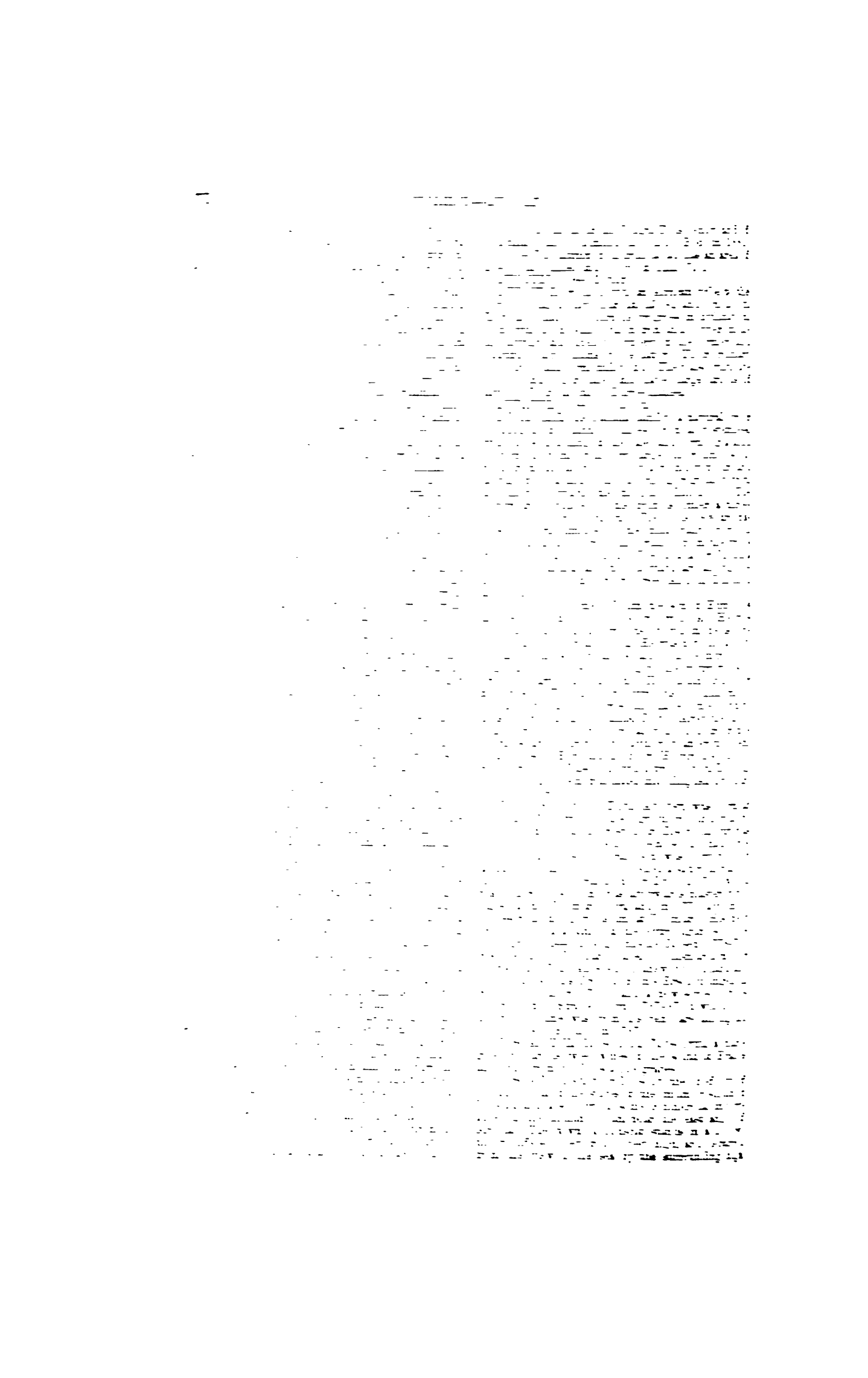
MUROM, a town in Russia, in the government of Vladimir, 75 miles south-east of the town of Vladimir, on the left bank of the Oka. It is one of the oldest towns in Russia, contains a cathedral and sixteen other churches, and has manufactures of linen, leather, soap, and tiles; and some trade in leather and corn. Pop. 11,286.

MURPHY, Arthur, a miscellaneous writer, born in Ireland 1727, was sent at the age of ten to the College of St. Omer, where he remained six years. He afterwards engaged in mercantile pursuits, but ultimately devoted his time entirely to literature. He made at one time an attempt as an actor, and afterwards studied law, and was called to the bar in 1762. In October, 1752, he published the first number of the Gray's Inn Journal, a literary periodical, and first essayed his dramatic powers in the farce of the Apprentice, which was followed by the Upholsterer. In 1759 he produced the Orphan of China, from the tragedy of Voltaire, and a variety of other pieces of tragedy, comedy, and farce, for the groundwork of which he was generally indebted to some foreign original. Of these the Grecian Daughter, The Way to Keep Him, All in the Wrong, and Know your own Mind long kept the stage. In 1788 he retired altogether from the bar, and occupied himself entirely for the press. In 1792 appeared his essay on the Life and Genius of Dr. Johnson; and in 1793 he published his translation of Tacitus, with historical supplements. In 1798 appeared his tragedy of Arminius; and his warmth in favour of the then pending war obtained him a pension of £200 per annum. He died in June, 1805. One of his latest works was a life of Garrick; and a translation of Sallust appeared after his death. Churchill said that dulness had marked Murphy for a mayor. His translation of Tacitus, which is a free rendering with the historical gaps filled up, is commended by several critics as accurate and elegant, though somewhat periphrastic.

MURRAIN, a name given in general to any widely prevailing and contagious disease among cattle, though in different localities it is also used as the name of some specific disease. Thus in England the name is often given to a virulent inflammatory disease which attacks and usually confines itself to one of the hind quarters of the animal, and is attended with all the symptoms of putrid fever. It usually proves fatal in ten or twelve hours.

MURRAY, a river in the south-east of Australia, supposed to rise near Mount Wellington, or Kosciusko, from which it flows circuitously north-west to Mount Lookout about lat. 34° 10′ S., then west with various windings to Elbow, lat. 34° S. Here, bending suddenly round, it flows S.S.W., and after a course estimated at not less than 1100 miles falls into Lake Victoria at Wellington. Its chief affluents are the Murrumbidgee and Darling.

MURRAY, Lindley, grammarian, was born at Swatara, near Lancaster, Pennsylvania, of Quaker parents, in 1745, and educated in an academy of the Society of Friends. About the age of twenty-one



rocks. Its appearance by no means corresponds with the wealth and importance of the place. Large buildings are few, and the sultan's palace (a plain edifice), the governor's house, and a few minarets, alone rise above the humble mass of flat-roofed huts or houses. The streets are extremely narrow, so that a few palm leaves laid across between the houses above completely screen them from the sun. The situation of Muscat, at the foot of high cliffs, and nearly surrounded by bare rocks, renders it one of the hottest places in the world. Of water a sufficient supply is obtained from wells about 40 feet deep. About 3 miles by land from Muscat is the town of Mattrah, a kind of suburb of Muscat, where are the docks for building and repairing shipping. As it stands in an open plain, exposed to the sea-breeze, it is cooler than Muscat, so that many of the wealthier merchants of the latter place have their dwellings at Mattrah, and spend only the hours of business in the neighbouring city. The combined population of Muscat, Mattrah, and intervening villages, has been variously estimated at 25,000 and at 60,000. It is estimated by Palgrave to have decreased in recent times from 60,000 to 40,000 from the unhealthiness of the place and the attacks of the Wahábí.

Muscat was occupied by Albuquerque in 1507. In 1651 it fell again under a Mohammedan ruler. In the latter half of the last century it had attained, under a ruler who bore the religious title of Imam, considerable importance as a seaport. In 1808 Seid Said succeeded to the sovereignty, having assassinated his cousin Bedr, who was inclined to the doctrines of the Wahábí. He made an alliance with the British government in Bombay for the suppression of piracy in the Persian Gulf. In 1819 the pirates were reduced to unqualified submission; and, two years later, a British expedition, marching into the interior of Omán, suppressed an insurrection and established the authority of Seid Said. His sovereignty commenced on the east coast of Africa at the river Mozímbue, about 60 miles south of Cape Delgado, and continued north as far as the equator. It did not imply any territorial possession beyond what was necessary to secure the trade of the coast. In like manner a large portion of the coast of the Persian Gulf acknowledged his sway, so that, including Omán and the African islands Zanzibar, Monfia, and Pemba, the coasts ruled by him, for the most part only commercially, could not have had an extent of less than 3000 miles. In 1840 Seid Said removed the court and seat of government from Muscat to Zanzibar, and in 1856 died on the return voyage from a visit paid to the former place. On this event occurring his dominions suffered a division, his son Mejed succeeding him as Sultan of Zanzibar and ruler of the African territory, and another son acquiring Muscat and the dependencies in Asia. Since then the government has been subject to repeated revolutions. Muscat was seized by Seyyid Joorkee on 1st Feb. 1871.

MUSCATINE, a town of the United States, Iowa, capital of county of same name, on the Mississippi, at the apex of what is called the Great Bend, in the midst of picturesque cliffs, and in connection with an extensive network of railways, 27 miles south-east of Iowa city. It contains sixteen churches, planing, saw, and flour mills, and having an excellent landing-place is the centre of a large and increasing trade. The annual sale of lumber exceeds 10,000,000 feet. Pop. (1880), 8214.

MUSCLE AND MUSCULAR MOTION. The name *muscle* is applied to those structural elements or organs in animals which are devoted to the production of movements, either of a part of the body, or of the body as a whole. A *muscle* may be viewed as a collection of fibres, each of which possesses the property of contracting or of shortening its length, under the influence of a stimulus of one kind or another. This shortening of its length, it may be remarked, is counterbalanced or compensated for by a proportionate increase in the transverse dimensions of the fibre; and in this way the actual 'volume' of the structure during contraction is the same as when in a state of repose. To the property possessed by muscular tissue of thus shortening or contracting itself the term *muscular contraction* is applied, and through this primary movement or property of the fibre, applied in various ways and to various ends, all the movements of the animal body are produced and maintained.

In the lower or invertebrate animals, with the exception of the Protozoa or lowest sub-kingdom, muscular tissue is generally found; and in its general and essential structure, that of Invertebrata and of Vertebrates also, admits of division into two obvious kinds, known respectively as *striped* or *voluntary*, and as *unstriped* or *involuntary* muscular tissue. These terms have reference to the microscopic or histological structure, and to the mode in which the functions of muscles are exercised, as will be presently pointed out. With regard to its general nature and chemical composition muscular tissue may be described as being of a very elastic nature. Its analysis shows the presence of a considerable quantity of water, amounting to a quantity nearly as great as that found in the blood. The following table gives the results of an analysis of muscle by Berzelius, which closely correspond with those obtained by other chemists, notably Schultze and Marchaud:—

Muscular substance	15·80
Gelatin (derived from areolar tissue)	1·00
Albumen and hæmatin	2·20
Phosphate of lime and albumen	0·08
Alcoholic extract with salts (lactates?)	1·80
Watery extract with salts	1·05
Water and loss	77·17
	100·00

This composition has been ascertained to be consistently uniform, with reference to the source, and to the kind of muscle analyzed. The proper and essential muscular substance—the *myosin* of living muscle, and the *syntonin* of dead—belongs to the group of the 'proteine-compounds.' It corresponds in its general nature to albumen in a coagulated state, and thus differs from *fibrin*. From striped muscular tissue when pressed, and if in a fresh condition, and perfectly free from blood, a fluid, which speedily coagulates, may be obtained. This fluid coagulates naturally in a certain time after death has taken place—the period at which this natural post-mortem coagulation takes place varying with the manner of death, and with the surrounding circumstances, or conditions amid or under which the subject may be placed. The result of this coagulation is to render the muscles stiff and rigid, and to induce in consequence a fixed state of the limbs and body generally; this feature being well known under the name of the 'stiffening of the body,' or *rigor mortis*. After a longer or shorter period the coagulation gives place to a process of liquefaction among the muscular tissues, and the stiffness and rigidity pass off. The body becomes supple and pliant, and putrefactive changes speedily begin to be apparent within the tissues generally of the body. 'Rigor mortis' begins earlier in cases where the muscular exertion or exhaustion before death has been very great; and in proportion as it occurs soon after death, so it passes off more quickly than when its first appearance is

retarded; which latter result is seen in cases of sudden death, and where the irritability of the muscular tissue is retained for a longer period. The 'rigor mortis' affects both striped and unstriped muscles, and it also appears to influence muscles independently of their having been functionally inert prior to death, as in cases of paralysis and similar affections. The rigidity generally first appears in the muscles of the neck and lower jaw; then it occurs in the upper limbs, and passes downwards. It passes off in much the same order of succession. Its latest period of appearance is about seven hours after death (Sommer). The *myosin* or fibrin of muscle exists in a fluid state in *living* muscle; and during life muscular tissue is generally *alkaline*, or may be *neutral* in its reaction, whilst dead muscle gives an *acid* result; this result proceeding from the process of decomposition producing the albuminoid material known as *syntonin*.

The ultimate fibres of *striped* or *voluntary* muscle are each about $\frac{1}{400}$th of an inch in breadth, and when examined microscopically are seen to be of a yellowish colour, and to be marked by delicate transverse *striæ* or lines; the striated or striped appearance being in reality due to the regular and alternate disposition of parts or structures possessing refractive properties of different kinds. The entire muscle is made up of bundles of fibres known as *fasciculi*, which are connected together, and at the same time defined, by layers of fibro-cellular tissue. Each fasciculus is separable into a larger or smaller number of lesser bundles, also encased in fibro-cellular layers; and by a process of assortment these smaller fasciculi can at length be resolved into the separate muscular fibres or *primitive fasciculi*, the microscopic appearance of which has just been described. Each primitive or ultimate fibre is inclosed within a delicate sheath of tissue, allied to elastic tissue in its nature, and known as the *sarcolemma;* and within this sheath the fibre may be broken up into finer thread-like parts — the *fibrillæ* of the muscle — in each of which may be observed the striated or striped appearance recognizable in the entire fibre itself. The parts which are dark in the fibrillæ, and which are thus the most highly refractive, are termed by Bowman the *sarcous elements* of muscle; the lighter or less refractive parts being of a less dense structure. Ultimately, and by delicate manipulation, the fibrillæ of muscle may be incompletely divided across into a series of discs, which discs represent the sarcous elements of the muscle. The muscular fibres of the heart, which are striped in their nature, are more finely striated than ordinary muscles; these fibres also branch and unite with each other, and the investing sheath or sarcolemma is absent in the cardiac muscular tissue.

Striped Muscular Tissue as seen under the microscope.—A, Fibril deprived of the sarcolemma, to show the discs of which it is composed. A', One of these discs. B, Several fibres less magnified.

The *striped* muscles are also known as those of *animal life*, and as *voluntary* muscles. The latter term applying to them, since they are those muscles which are generally under the control of the will; although the heart, as composed of striped muscular tissue, presents an exception to this rule. And certain other muscles—such as those connected with respiration; those of the pharynx, urethra, &c.—which are partly involuntary and partly voluntary in their mode of action, also exhibit the structure characteristic of striped muscles.

The *involuntary, unstriped* muscles, or those of *organic life*, are so named, firstly, from the fact of their invariable non-subservience to the will; secondly, because of their *unstriped* or *non-striated* structure; and thirdly, on account of these muscles being devoted to the maintenance of movements in functions (such as digestion, &c.), which, from their occurring both in animals and plants, are known as *organic* functions. Microscopically examined, the fibres of involuntary muscle are resolvable into bodies of elongated, fusiform, or spindle-like shape, averaging about $\frac{1}{4000}$th of an inch in diameter, and $\frac{1}{20}$th of an inch in length, and known as the *fibre-cells* of Kölliker. These cells are clear, of granular consistence, and readily broken. They possess an inner particle or *nucleus;* and the fibres which they form by their aggregation are not invested by a sarcolemma or sheath. Examples of involuntary muscles are found in the muscular coats of the stomach and intestines, ureters, bladder, bronchial tubes, and gall-bladder; in the ducts and glands; in the uterus; in the coats of blood-vessels and absorbents; in the *tunica dartos* (testicle); in the iris of the human eye, &c. Unstriped fibres are also found in the true skin or *cutis;* and by the contraction of these latter fibres the skin-*papillæ* are brought out prominently under stimuli, such as cold, fear, electricity, &c., and produce the effect familiarly known as 'goose-skin'—the *cutis anserina* of the physiologist.

The *nutrition* of muscular tissue is effected through vascular or capillary net-works, which ramify on the sarcolemma; although the muscular fibres themselves do not appear to be entered or penetrated by blood-vessels. The muscular tissue is therefore nourished by the nutrient matters from the blood being absorbed from the blood-vessels through the sarcolemma. The presence of lymphatic vessels in muscle is denied by some authorities. The smaller muscles are said by Kölliker to be entirely destitute of absorbents; and it is probable that wherever present, the lymphatics ramify within the sarcolemma and investing tissues, rather than within the muscular tissue itself. Striped muscles are abundantly supplied with nerves, which are distributed to the muscular tissue in the same manner as the blood-vessels; namely, on the sarcolemma, and not within the fibres of the muscles. The nervous influence is therefore exerted through the muscle-sheath; and the ultimate ramifications of nerves in muscle appear to assume the form of looped extremities, which, after expanding to form the loop, become connected to the main trunk of the nerve, or to that of adjacent nerves. The striated muscles are of the two kinds the most abundantly supplied with nerves, which are mostly of the *motor* kind. The unstriped muscles are not so abundantly furnished with nerves; and these latter muscles derive their nervous supply almost wholly from the *sympathetic* or *ganglionic* system of nerves.

Muscular tissue is *developed* from the cells and corpuscles of connective tissue. The primitive cells from which the tissue is formed are developed in a linear manner, and by the absorption of the partitions between the cells a tube is formed, which ultimately constitutes the sarcolemma of the fibre. The nuclei or cell-centres remain, to form, along with other portions of formative matter, the fibre itself.

Muscles are classified in various ways; according to structure as we have seen, or according to their function, or by their positions and situations in the body. For example, some muscles are attached to bones, which they move after the fashion of levers. Such muscles are said to *arise* or *take origin* from definite points of bones, and are generally *inserted* into bones by *tendinous* prolongations of the muscular substance. The insertion is the moving point, and the origin the fixed point of the muscle. The *tendons* of muscles vary in length and breadth. They represent inelastic bands of fibrous tissue, the fibres of which insensibly merge into and become continuous with their attached muscular fibres. When the tendinous fibres of muscles become greatly broadened out, so as to form fibrous webs or membranes, which separate or inclose muscles, or which afford extensive surfaces for their attachments, the term *aponeuroses* is then applied to them. Such *aponeurotic* expansions are seen in the terminations of the muscles of the abdominal wall, in the scalp, and in other situations. The limit or extent of the action of a muscle is determined by the length of its fibres, whilst its degree of force or strength depends on the number of the fibres. Other muscles are not attached to bones as levers, but on the contrary surround and inclose cavities, which they limit or expand as required. Such *hollow* muscles are exemplified in the heart and uterus, in the muscular fibres of blood-vessels, in the muscles of the digestive tract, in the iris of the eye, &c.

The nature, mode, and effects of muscular action may be briefly considered in connection with the present subject. The muscles which have the most active functions are those most abundantly nourished. Every action on the part of a living being results in the production of a certain amount of waste material, evinced by perceptible differences in the chemical composition of the tissue. And when we reflect that the nervous and vascular supply of muscle is also concerned in muscular work and waste, the entire question is seen to assume aspects of a very intricate and complicated nature. Increased exercise of muscles—as seen in gymnastic exercises, or in the exercise of certain trades (for example, the arms of the blacksmith and the lower limbs of the ballet-dancer)—demanding increased nutrition, results in the increased growth of the muscle, and in the formation of new tissue. This result, it is evident, can only take place when the nutrition of the tissue keeps pace with, or slightly outstrips its waste and wear; and muscular tissue appears to rank among those structures in which actual loss or disintegration is either but partly made good, or in some cases may not be repaired at all.

The property of *contractility* distinctive of muscular tissue, and through which its functions are manifested, is generally, though not always or invariably, brought into action through the stimulus of the nervous system, or more widely speaking, through stimuli conveyed to the muscular fibres through the nerves. Contractility, however, may be excited in muscles which are abnormally deprived of nervous stimuli, as by division of the nerve-trunks which enter the muscle; or contractility may be present in cases in which no appreciable nervous fibres can be traced. We thus come to regard contractility as a natural property or quality of muscular tissue. The striped muscles are those which respond most typically to the stimulus of the nerves, whilst the non-striated or involuntary muscles exhibit a lower degree of subservience or response to nervous stimuli of a voluntary or ordinary kind. The terms *irritability* and *tonicity* have been employed in physiological science—the former to indicate the nature of the stimulus or of the contractile property which operates to produce contractions in *voluntary* muscles; whilst the name tonicity is applied to denote the state of normal and continued contractility in which the fibres of most of the *involuntary* muscles are found—this latter phase being induced apart from the irritation of any purely voluntary or nervous stimulus. Muscles also possess powers of receiving *sensations*, in virtue of the *sensory* nerve-fibres with which they are provided; and the striped muscles are those which most fully exhibit this sensibility. The exact mode in which muscular contraction is effected has formed a subject of much discussion among physiologists. The intimate parts of the fibrils are believed to be more closely applied to one another at the time of contraction, with the effect of rendering the entire fibril flatter and wider in its general conformation, and of thus bringing the transverse striæ closer together. The entire muscle thus contracts through the shortening of its component fibrils, and the alteration produced, as already remarked, is merely one in form, and not in the bulk or volume of the muscle. When muscles contract heat is evolved, and sound is also produced; and, according to some, electricity may also be developed. Muscular contraction in a healthy and normal sense is capable of being effected only when a due and full supply of pure or arterial blood is conveyed to the tissue. In cases of ligature of the large blood-vessels of a limb the muscles are partially or wholly paralyzed until the collateral circulation, or that through the anastomoses or union of the different blood-vessels, is fully inaugurated and maintained. Arterial blood thus supplies the necessary nutritive material to muscular tissue, and also the oxygen which, in common with all the tissues of the animal, muscle requires for the due repair of its disintegration and waste. Of the two kinds of muscle voluntary muscular tissue is that which is most fully dependent upon a due supply of arterial or oxygenated blood. Involuntary muscles, such as the heart, appear capable under certain circumstances of performing their work when supplied with venous blood only, for a longer or shorter period. Muscular exertion or work is chiefly sustained by the absorption or combustion of the non-nitrogenous constituents of the food. Violent exercise will thus not materially increase or diminish the amount of nitrogenous material required by or evolved from the body. The matter necessary for muscular repair is chiefly of non-nitrogenous or carbonaceous kind; and carbonic acid and water, into which by the presence of oxygen this matter is converted, represent the chief elements in muscular waste, and in the results of muscular work.

The subject of the various kinds of *muscular actions* involves, besides the physiological considerations just pointed out, aspects of a mechanical kind also. The voluntary muscles thus constitute moving powers for the bones as levers; and in the living body we have examples of the three kinds of levers which mechanical science distinguishes. In the familiar action of the *biceps* muscle, which flexes or bends the fore upon the upper arm, we have an instance of a lever of the third kind, in which the *power* (represented by the insertion of the muscle on the radius or bone of the fore-arm) is placed between the *fulcrum* (at the elbow-joint) and the weight (in the hand). The lever of the second order may be illustrated by the raising of the body upon the toes, as in the act of making a step forwards in walking. Here the weight (represented by the body pressing on the ankle) is placed between the fulcrum (formed by the fixed toes) and the power (represented by the muscles of the calf). And as an illustration of a lever of the first order the motion of the foot as in pressing on a

of astronomy; Erato of lyric and erotic poetry; Polyhymnia of the sublime hymn, and Terpsichore of the dance. If we translate their names, Erato signifies the *lovely;* Calliope, the *eloquent;* Euterpe, the *pleasing;* Thalia, the *joyous,* particularly at feasts; Melpomene, the *musical;* Polyhymnia, *variety of song;* Terpsichore, the *dance loving;* and Clio, *fame.* (See the separate articles.) Their surnames are, for the most part, derived from their places of residence—Helicon, Pindus, Parnassus, and the sacred fountains there (hence *Castalides, Pimpleides,* &c.) They are commonly represented as beautiful virgins, adorned with wreaths of palm leaves, laurel, roses, or the feathers of the Sirens. They dance in a circle, together with Apollo, who in later times was styled Musagētēs, or leader of the Muses. Their worship extended from Greece to Italy; and among the Romans they were sometimes identified with the *Camenæ.* In Rome they had a separate temple, and a grove was sacred to them. The swan, the nightingale, and the grasshopper were also sacred to them. They had a knowledge of past ages, and were invoked by poets at the commencement of their lays.

MUSEUM, a name given to every collection of interesting objects of nature or art (including industrial art) brought together for the instruction of the student or the satisfaction of the curious. The word originally signified a temple or haunt of the Muses, in a sense akin to which it was applied to an institution at Alexandria, the building belonging to which adjoined the temple of the Muses, founded, as appears probable, by Ptolemy Sōtēr and fostered by his son Ptolemy Philadelphus, and intended for the reception of native and foreign men of learning and science (such as Euclid, Timocharis, Aristarchus of Samos, Aratus, Theocritus, Hegesias, Theodorus, and others), who were maintained at the king's charges in order that they might have leisure to devote to their own pursuits. Works of the fine arts, collected in museums, cannot produce the same effect as when in the places for which they were originally intended. When the images of Heracles, Hermes, and Cupid stood in the gymnasia; when Alcamenes' statues of Aphroditē were half hidden by bowers and trees; when the figures of Artemis with her nymphs were found in lonely forests; Myron's groups of the Nereides on the sea-shore; the statues of Apollo, Bacchus, and the Muses, in the theatres; the lofty image of Zeus at the Olympian games; or in more recent times, when the picture of the Virgin stood over the altar surrounded by columns and arches—then the works of art were in their proper places, and produced the effect for which the artist intended them. But a deluge of barbarism swept over the civilization of ancient times, and the works of ancient art were hurled from their seats. When the light of civilization again dawned upon Europe it was natural for men to seek with avidity for the relics of ancient art; and, as the changes which had taken place in religion and in social institutions forbade the restoration of them to their old uses, they were treasured up in collections as proofs of the existence of a perfection which mankind had long lost. But this spirit of collecting may be carried, and has been carried, to an extreme. In the last century, particularly, the governments of many countries thought themselves authorized to despoil all the provinces of the few works of art which they had preserved, and to crowd them, often without any taste, in collections, into the capital. Of late the mode of arranging museums has been greatly improved, the works of art being disposed in situations corresponding to their character.

We find the first collections of works of art in the peristyles of ancient temples. Delphi with its treasure chambers, divided according to the different tribes of Greece; the temple of the Samian Hera, and the Acropolis at Athens were very rich in works of art, consisting of consecrated gifts arranged with taste. The successors of Alexander accumulated all kinds of works of art in their royal seats in order to carry them about at their triumphs in long processions. Similar was the fate of foreign works of art in ancient Rome. The captured statues were carried about like slaves; and among the Roman emperors there was more than one imitator of Nero, who ordered 500 statues to be sent from Delphi to ornament his 'golden house.' The practice of removing works of art from their original localities had therefore already begun; real museums, however, existed not as yet. The nearest approach to the museums of modern times were the collections of seal-rings and gems, and of Murrhine vases, which, from the time of Sulla, had become a favourite luxury among the wealthy Romans. The barbarians afterwards broke in upon Rome, and the works of art were involved in indiscriminate destruction. The finest marbles were used for building walls; the noblest statues were burned for lime. Hardly a single statue or picture escaped, except those which were buried under the ruins, and thus preserved by the very extent of the surrounding destruction, to kindle in future ages a new love for the fine arts. The earliest of modern collections was perhaps that of Cola Rienzi, about the middle of the fourteenth century. In Florence began the dawn of a new day for the fine arts, in the age of the Medici. Cosmo I. collected antiques and laid the foundation of the famous Florentine museum. Other princes of Italy soon followed the example. Pope Leo X., of the family of Medici, transplanted the love of the fine arts, which distinguished his house, to Rome. The villa of the Medici, on Monte Pincio, became the place in which antique works of art, which had been hidden where destruction had not been able to reach them, were concentred. The noble families of Rome, and by degrees of all Italy, were inspired with a kindred zeal, and so everywhere commenced excavations in order to find ornaments for their villas and palaces. Collections of coins were first made. The family of Este made the first collection of gems. Afterwards came collections of busts; yet these as well as statues were used in preference as ornaments in festival halls, in gardens, and yards (*cortili*), instances of which are the *cortile* in the Belvedere, and the villas in and near Rome. The arrangement of the antiques in the nine *stanze* of the Villa Borghese was beautiful. Museums now became more and more common, and works were crowded together without taste and convenience. As the erudition of the Alexandrian scholiasts, though valuable, is not of equal worth with the poetry of Homer, so museums, though certainly noble establishments, and necessary to keep alive a taste for the fine arts, are not to be compared with the living activity of art; and it is gratifying to see that the effect of museums at present is to awaken genius to original production, instead of making mere copyists of ancient creations, as was once the case, when modern art seemed to be rather a matter of erudition than the offspring of native inspiration.

The most famous in Italy are the museum in the Vatican, which occupies almost all the rooms of that immense palace, and those in the Capitol and in the Lateran, all at Rome, and remarkable for their collections of statues, reliefs, and other works in marble, which are the finest in the world; the Museo Nazionale (formerly Real Museo Borbonico) at Naples, which is peculiarly rich in remains of antiquity discovered in Herculaneum and Pompeii; the museum at Florence, and the collection of Greek works in

MUSHROOM. See AGARIC and FUNGI.

MUSIC (Greek, *mousikē*, literally the art over which the Muses presided). The original education of the Athenians comprehended two distinct branches, gymnastics for the body and music for the mind. The latter term, however, had a much wider signification then than it now has, comprehending not only the art of playing the lyre or taking part in a chorus but also elocution; and latterly, as knowledge advanced, the term was applied to all the learning and accomplishments of the time. In its more modern and restricted sense music may be defined as the art of combining sounds in a manner agreeable to the ear. Its study comprises three branches: 1, the science of acoustics, which treats in part of the nature and relations of musical sounds; 2, musical composition, which is both an art and a science, and is what is generally called the theory of music; and 3, the art of performing music, vocal or instrumental, or what is generally understood by the practice of music. It is with the first two branches, and more especially

MUSIC

MUSIC

of the alphabet, or by certain syllables; the same letter or syllable stands for the note and its octave. Taking C or Do for our fundamental note we have for our scale—

C D E F G A B C D E F G A B C, &c.
or Do Re Mi Fa Sol La Si Do Re Mi Fa Sol La Si Do, &c.

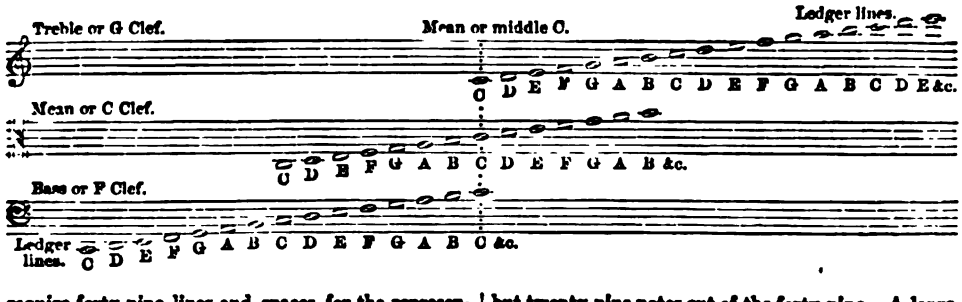
The scale may be extended up or down so long as the sounds continue to be musical. The sense of completeness which this scale gives the ear results from its being formed on true harmonic principles. Harmony is produced by a coincidence of vibrations; the oftener the vibrations of two notes coincide the more harmonious these notes are. We have already seen that the closest coincidence exists between the key-note and its octave, the latter being produced by halving the string, which vibrates twice as fast in a given time as the whole string. By dividing the string into three parts we obtain a note higher than the octave, which may be lowered by an octave by taking two-thirds of the original length, and produces a wave of which three coincide with two of the key-note. This note, called the dominant, stands, next to the octave, in the closest relation to the key-note. Dividing the string into fifths and lowering the note two octaves we obtain another harmonic, the mediant. Supposing C to be the key-note, or tonic as it is frequently called, G is the dominant and E the mediant. These three notes when sounded together form the harmonic triad or common chord, and stand to each other in the relation of 1, $\frac{3}{2}$, $\frac{5}{4}$, or when expressed in whole numbers, 4, 5, 6. When a musical string is vibrating a keen ear will hear the dominant and mediant sounding along with the tonic, being generated by the spontaneous division of the string into aliquot parts producing subordinate vibrations simultaneously with the principal vibrations. The dominant may be used as the tonic, and from it is generated in turn a dominant and mediant, as in the first instance, giving us the triad G B D. Again, taking the note F, whose dominant is C, we get the triad F A C; the first in this group is called the subdominant. We have now obtained all the notes in the diatonic scale from the harmonics of the tonic and the two adjacent triads. A being the mediant of the subdominant is called the submediant; D, the dominant of the dominant, is called the supertonic; and B, the mediant of the dominant, is called the leading note or dominant seventh. We have already observed that the notes of each triad stand to each other in the relation of 4, 5, 6. Now, adhering to this proportion, and multiplying to avoid fractions, we have F A C E G B D as 16, 20, 24, 30, 36, 45, 54. To bring them within the compass of an octave we must multiply F and A by 2 and divide D by the same number, which gives us the following result,

C D E F G A B C
24 27 30 32 36 40 45 48

which are the degrees of the diatonic, or, as it is often called, the natural scale, which is produced by the white keys of an organ or pianoforte. By a further analysis of this scale into two it will be seen that C and D, F and G, and A and B stand related to each other as 8 to 9; D and E and G and A as 9 to 10; while E and F, and B and C are related as 15 to 16. The interval between any two consecutive sounds is called a second, and we have as just seen three kinds of seconds, C to D, F to G, and A to B, which are called major tones, D to E and G to A, which are called minor tones, and E to F and B to C, called major semitones. The interval between two alternate sounds, as C and E, D and F, or E and G, is called a third. Thirds are of two kinds; major, as between C and E, which is made up of two tones, and minor, as D to F, which is made up of a tone and semitone. In like manner the intervals between C and F, D and G, E and A, &c., are called fourths, which are also of two kinds, all those mentioned being minor, while that between F and B is called major, being greater, as may be now seen at a glance, by a semitone. So we may have intervals of a fifth, sixth, seventh, or eighth reckoned from any note whatever. We cannot follow this branch of the subject further, but must refer the reader for more ample information to works on acoustics, of which Professor Helmholtz's Lehre von den Tonempfindungen is among the most renowned.

II. We come now to treat more at length of the second division of the subject—namely, musical composition. This comprehends, first, the explanation of the various symbols used, or what may be termed the alphabet of music; and secondly, the rules laid down to produce effective and grammatical musical composition. Every sound employed in the art of music is represented by characters called notes on a staff—that is, five equidistant horizontal lines on or between which the notes are placed. A note represents a higher or a lower sound according as it is placed higher or lower on the staff. The lines and spaces are counted upward; from a line to a space is one degree, and there are thus nine degrees on the staff, or including the position immediately above the fifth line and that below the first, eleven degrees. When any note is higher or lower in pitch than can be placed upon these degrees short lines called ledger lines are added above or below the staff. Although the total number of musical sounds ranges through nine series of octaves, yet in the written language not more than seven series are employed, and these

EXAMPLE 1.


Treble or G Clef.
Mean or middle C.
Ledger lines.
C D E F G A B C D E F G A B C D E &c.
Mean or C Clef.
C D E F G A B C D E F G A B &c.
Bass or F Clef.
Ledger lines.
C D E F G A B C D E F G A B C &c.

require forty-nine lines and spaces for the representative notes. The five lines of a staff, with five ledger lines above and five below it, together with the fourteen spaces between all these, will contain but twenty-nine notes out of the forty-nine. A large number of ledger lines is, like all other small signs, embarrassing and injurious to the eyesight. To surmount these obstacles musicians have resorted to the

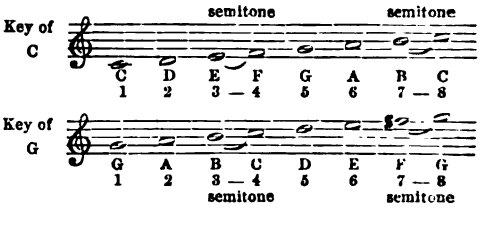
use of more than one staff. The staves are the bass, mean, and the treble. The second is now seldom used, as it is found that for most practical purposes the first and last will generally suffice. The treble staff, which contains the upper notes, is distinguished by a character called a G or treble clef, the bass by a character called the F or bass clef, and the mean by a character called the C or mean clef. (See Example I.) The mean clef may be placed on any line of the staff, and the line it is placed on represents that on which the C on the ledger line between the bass and treble staves stands. Being now little used we shall not again introduce it into our examples. The treble and bass clefs only are required for keyed instruments of the pianoforte kind, and when a staff is wanted for each hand they are joined by a brace, the upper staff carrying the notes generally played by the right hand and the lower those played generally by the left. (See Example II.) These notes correspond with the white keys of the pianoforte or

EXAMPLE II.

organ, the black keys producing the semitones. It is owing to this arrangement of the key-board of these and similar instruments that musicians have come to talk of the diatonic scale of C as being the natural scale. To the human voice, the most perfect of all musical instruments, one scale is as natural as another. We have hitherto, for simplicity's sake, used the model scale. We now come to treat of the others, or rather the one diatonic scale seated in different positions. From what has been already said it is evident that the steps in every scale must correspond to those of the scale of C—that is, between the first or key-note to the second there is the step of a major tone; from the second to the third, a minor tone; from the third to the fourth, a semitone; from the fourth to the fifth, a major tone; from the fifth to the sixth, a minor tone; from the sixth to the seventh, a major tone; and from the seventh to the eighth, a semitone. Were the tones all equal and the semitone exactly half a tone, dividing the seven intervals into twelve, it would not matter even on fixed toned instruments where the scale began. A system based upon such a supposition is adopted for instruments with a key-board similar to the pianoforte. (See TEMPERAMENT.) The disadvantage of equalizing the tones and semitones is that the music obtained from these instruments is never agreeably in tune; its melodies and harmonies are deficient in richness of effect, and the piece performed, whatever it may be, possesses much insipidity. This ought never to occur in music performed on free-toned instruments.

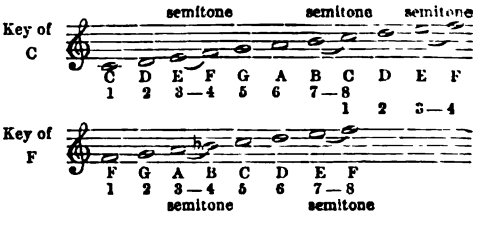
The range of a piece of music will not be always such that its key-note will be C and at the same time come within the limits of the voice or instrument by which it is required to be performed. Thus a melody written on the key of C might have some of the notes as low as G below the staff, which is below the compass of a soprano voice, whose best tones lie above mean C. Suppose we raise the melody five notes, thus transposing it to the key of G, we bring it within easy range of the voice. Looking at the notes on the staff as representing sounds of absolute pitch we find that in the model scale the semitones occur between E and F and B and C, or, in other words, between the third and fourth and seventh and eighth. Now if we wish to make G the key-note it is clear that without some contrivance the notation of the scale from G to its octave would throw one of the semitones out of its place—namely, that between E and F, which, instead of being, as it ought to be, between the seventh and eighth, is between the sixth and seventh. It is obvious then that if we raise the F a semitone we shall restore the interval of the semitone to a position similar to that which it held in the key of C. By a glance at Example III. this will be distinctly seen. The character placed on the line before F is called a sharp, and sig-

EXAMPLE III.



nifies that the note has been raised a semitone. If D be taken as a key-note we shall find it necessary to sharpen the C as well as the F in order to bring the semitones into their proper places. Still proceeding by fifths, and taking A as a key-note, a third sharp is wanted to raise G. E requires a fourth sharp to raise D. By means of a fifth sharp on A we obtain the scale of B, and by adding a sixth sharp on E we have the scale of F sharp. The scale of C sharp, with seven sharps, is rarely if ever used by good musicians. This series of scales with sharps is obtained by taking the dominant, first of the model scale as the key-note and then of the others in succession, and sharpening the fourth of the original scales to make it the seventh of the new. Another series is obtained by taking the subdominant of the model scale as the key-note and lowering its seventh a semitone, making it the fourth of the new scale, or scale of F. Taking the subdominant of the scale (B) as the key-note we require to flatten the E in addition to the B, and so on until we have lowered

EXAMPLE IV.



all the tones in the scale a semitone. This flattening is represented by a mark called a flat, which is placed

on the line or space on which stands the note to be so affected. (See Example IV.) In order to save the repetition of these sharps and flats it is usual to put them at the beginning of the staff, where they are called signatures. The reader will hardly need to be informed that they not only affect the note on the

EXAMPLE V.

same line or space but also its octaves. Example V. gives on the treble and bass staves the scales with sharps and flats most commonly in use.

Besides these forms of the diatonic scale, which, having an interval of two tones between the tonic and the third (in other words a major third), and is therefore called the major scale, there is another with an interval of a tone and semitone between its tonic and third, which is called the minor scale. Some musicians consider this virtually the major scale, with this simple difference, that the third below, and its octave the sixth above the tonic, is treated with the dignity of a key note, and that to more firmly impress this character upon it, the note immediately below it is sharpened so as to form a leading note. In the ascending scale, too, the harsh interval of the second between this leading note and the one immediately below it is generally avoided by sharpening the lower note. In the descending scale the sharps are removed, and the scale is identical with the major, beginning at its sixth and descending an octave. (See Example VI.) The character placed

EXAMPLE VI.

before the second and third notes of the descending scale is called a natural, and signifies that the notes previously sharpened are restored to their former or natural pitch. The natural is also used to raise to its former pitch a note which had been previously

EXAMPLE VII.

lowered by a flat. Each minor scale is called the relative minor to that from which it is formed in the way above indicated. Thus, the relative minor of the major scale, as may be seen from the last example, is A minor, and it is written with the same signature. The major scale of G has for its relative minor the scale of E minor, and so on. (See Example VII.) Each minor scale is also called the tonic minor to the major scale on the same key-note. The tonic minor scale to C major is C minor. One major scale is also said to be related to another, when it is raised from its dominant, or its subdominant: thus the scales of G and F are held to be nearly related to that of C.

There is still another kind of scale, called the chromatic, said to be derived from the Greek word *chrôma*, colour, because like colours in painting it embellishes the diatonic by its semitones. It usually ascends by sharps, and descends by flats. (See Example VIII.) From this it appears that the chromatic scale consists of thirteen notes, and it gives rise to a distinct species of interval called chromatic. For example, the chromatic semitone is the interval between any note and the same raised by a sharp

EXAMPLE VIII.

or lowered by a flat. Also the extreme sharp second consists of a tone and a chromatic semitone, being composed of two degrees, and so on.

Rhythm.—Hitherto the notes have been employed only as representatives of the various musical sounds, with reference to their pitch and distances from each other; but each note also serves to mark the relative duration of the sound it represents. If we wish to denote merely the sound, any form of note in the proper position may be employed; but if we wish to signify how long we would have the sound continued, we must use that particular form of note which

represents that length of sound. Example IX. will show at one view the various forms of the notes, and their relative value in respect to time. In church music we sometimes meet with a note twice as long as the semibreve, namely, the breve, written thus, , and in some pieces of modern music with one

EXAMPLE IX.

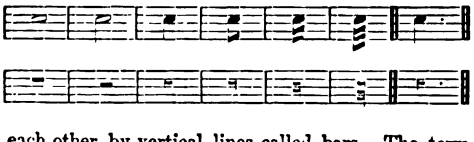
half the length of the demisemiquaver, written: The stems of the notes may be written upwards or downwards as convenient, and the hooks may be joined or detached at pleasure. It may be observed that each note may be taken as a unit; that the one next above it in time value is twice its length, and the one next below it is half its length. These differences in the length of notes, however minute they may appear, are insufficient for the purposes of music; accordingly other signs are used to mark these lesser divisions. A dot placed after a note lengthens it by one-half; two dots by three-fourths. Instead of the dot a note of its value may be written, and a curve, called a tie, written over it and the preceding note. Sometimes three notes of equal value have to be played in the time of two, in which case the figure 3 with a curve thrown over it is written above or below the notes. Two triplets (as this group is called) may be joined, and the figure 6 surmounted by a curve written over them; they are then performed in the time of four notes of the same form. (See Example X.) A sensible interval of time often occurs

EXAMPLE X.

between the sounding of two notes; this is represented by characters called rests, each note having a corresponding rest. A dot may be added to a rest in the same manner as a note, to indicate an addition of a half to its length. (See Example XI.)

Every piece of music is divided into portions equal in time, called measures, which are separated from

EXAMPLE XI.



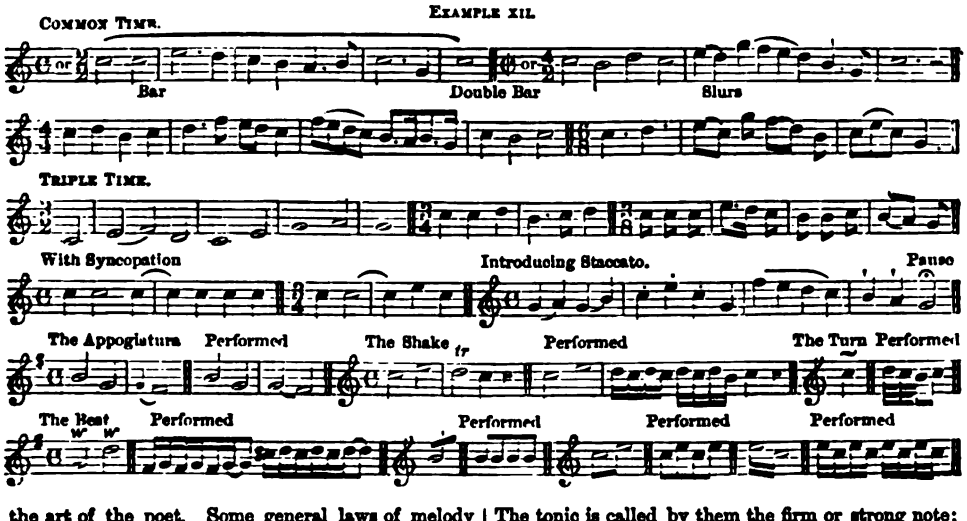
each other by vertical lines called bars. The term bar is often loosely applied to the measure as well as to the line. The exact length of the measure is indicated by a sign at the beginning of the piece of music. In common time, indicated by a C written after the clef, each measure contains a semibreve, or such notes and rests as make up together its value. Another form of common time, marked with a ¢, contains two semibreves in the measure, or their equivalents in minims, crotchets, &c. Another method of indicating time (or rather more correctly, rhythm) is by figures, in the form of a fraction. The figures of the denominator are either 2, 4, 8, and 16, which (the semibreve being considered the unit) stand for minims, crotchets, quavers, and semiquavers respectively; and the numerator shows the number of these fractional parts of a semibreve in the measure. This is by far the most precise plan, and has besides the advantage of enabling us to indicate time in a uniform method, as will be immediately seen. Besides common time, which may be indicated in two ways, there is triple time, in which a measure is made up of three minims, crotchets, or quavers, which can only be marked by figures; these are $\frac{3}{2}$, $\frac{3}{4}$, or $\frac{3}{8}$. When two or four measures of triple time are united in one measure the music is said to be written in compound common time, and is indicated by the fractions $\frac{6}{4}$ and $\frac{6}{8}$; rarer examples of compound time signatures are $\frac{9}{4}$, $\frac{9}{8}$, $\frac{12}{16}$, $\frac{12}{8}$, &c. The object of the division of musical passages into measures is to indicate their rhythm. Notes, like words or syllables, are accented or unaccented. The strongest accent is given to the first note of a measure. In common time of four notes to the measure the third has a subordinate accent, as, though in a less degree, the third measure note in triple time. In compound common time the subordinate accents fall on the first note of the last half of the measure, and in compound triple time on the first note of each of the groups of three of which the measure is composed. When a curve is placed over two notes in the same degree, but not in the same bar, the two notes are played as one of the length of both, and the first note acquires the accent. This displacement of the accent is called syncopation. If the curve is written over notes of different degrees it is called a slur, and indicates that the notes are to be played or sung smoothly, as if gliding into each other. When an opposite effect

is wanted, that is, when the notes are to be produced distinct and detached (*staccato*), a dot is placed over them. A dash implies a greater, and the combination of dot and curve a less degree of *staccato*. The pause, which is a short curve surmounting a dot, indicates that the note may be prolonged at the pleasure of the performer. (See Example XII.)

Before entering on the subject of harmony, we may also explain several of the other more important musical terms and signs. The various degrees of loudness and softness which occur in a piece of music are indicated as follows: *f*, for *forte*, loud; *ff*, for *fortissimo*, very loud; *mf*, for *mezzo forte*, moderately loud; *p*, for *piano*, soft; *pp*, for *pianissimo*, very soft. A gradual increase of the volume of sound is denoted by the word *crescendo* (contracted *cresc.*), or the sign <; a diminution of the sound by the word *diminuendo* (*dimin.*), or the sign >; these signs are united to indicate a gradual increase and diminution, and are then called a swell, <>. The appogiature is a small note placed before a large one of longer duration, which it usually deprives of half its value. The shake is a quick alternate repetition of a note with the note above it, the mark *tr* being placed above the lower, and the upper one not expressed. The turn ∽ employs the note above and the note below, in the manner shown in Example XII. The beat w is the reverse of the shake, and is generally made at the distance of the semitone below: hence all notes a full tone below require to be sharpened for the beat. The repeat 𝄋 is explained under the term Dal Segno. The dots which are found at the inner side of bars show that the measures included by them are to be played twice over. The double bar marks the conclusion of a piece, or of a section of it. In order to save time in writing music the following abbreviations are used: a single stroke drawn over or under a semibreve, or through the stem of a minim or crotchet, divides it into its value in quavers, a double stroke into semiquavers, and a triple stroke into demisemiquavers. Another abbreviation is much used in modern instrumental music, and is effected by grouping the stems of two minims in different degrees of the staff, like those of quavers, which signifies that the two notes are to be played as quavers and repeated, thus making up the time of the measure. (See Example XII.)

Melody is a particular succession of sounds in a single part, and is produced by the voice or an instrument. The art of introducing notes of different lengths succeeding one another at intervals pleasing to the ear must first be attained by every composer. The higher qualifications of the musician, the art of awakening certain feelings by certain successions of sounds; of communicating thoughts, grave or gay, of rousing to heroic deeds, or lulling to rest, solely by means of tones, wedded or unwedded to immortal verse, is one which cannot be learned any more than

Example XII.



the art of the poet. Some general laws of melody may be laid down as guides; but the musician who moves the heart, though he does not infringe them, rises above them.—The movement of a melody from one sound to the next in succession is called a melodic step; and a tune is more pleasing according as the steps proceed more easily: that is, as the melody is formed by the more simple and easy degrees, and not by large skips from sound to sound. The simplest, and consequently most pleasant intervals, are those of a second, major or minor, of a major or minor third, of a fourth, fifth, or sixth; less simple are augmented and diminished intervals, or those lying more than an octave apart. The character of a melody depends chiefly upon the notes employed, its rhythm, and its rate of movement. By one school of musicians, the tonic solfaists, it is held that each note of the scale has its peculiar character, and there is much to be said in favour of that opinion, although some of the descriptive terms may be open to objection. The tonic is called by them the firm or strong note; the second, the rousing note; the third, the calm or peaceful note; the fourth, the solemn or awe-inspiring note; the fifth, the clear or trumpet note; the sixth, the sad or melancholy note; and the seventh, the piercing note. If we accept this theory we can proceed upon a very simple plan, for if we wish to compose a stirring martial air we must employ chiefly the tonic, the second, and the fifth, and place them in the accented portions of the measure. If we wish to produce a grandly solemn melody, we must use the tonic and more frequently the fourth; if our melody is to be sorrowful, we must make frequent use of the sixth, which is the tonic of the minor mode, that in which the saddest airs of all nations are composed; and so on. The effect of rhythm is scarcely less powerful, as witness the majestic step of the two-note measure, the lighter tread of the measure of four notes, the grave yet graceful sweep of the triple time, and the airy elegance of the $\frac{6}{8}$ time.

Of less, though still of considerable effect, is the rate of movement. In quick time the ear has not time to get filled with each separate note as it strikes upon it in rapid succession, but is delighted with the fast, cheerful gallop as the bright sparkling tones chase each other; while in slow movements it has time to dwell upon every single note, each telling in some sort its own tale. A melody generally consists of an even number of phrases; this number may be four, eight, twelve, or sixteen. A phrase generally corresponds with a line in a verse of poetry, whilst a measure corresponds with one or two feet thereof. In composing an air for the voice care must be taken to arrange the notes so that those in the accented parts of the measure are set to the accented or emphatic syllables in the line. From this it follows that a tune may start on either the accented or unaccented part of a measure. This is illustrated in Example XIII. Melodies for hymns, songs, &c., may extend over one or more verses, and in order to pro-

EXAMPLE XIII.

duce an agreeable variety may pass from the form of the scale in which it started to another, generally to the one most nearly related to it. The most frequent changes are to the scale constructed on the dominant, say from C to G, or from G to D; less frequently, though by no means uncommon, the change is into the key of the subdominant, say from C to F, or from F to B; or into the related minor scales, as from C to A minor, and so on. This change from one key into another is called modulation, and is extensively used in the lengthy and elaborate compositions of our best musicians; in many of our simple hymn, ballad, and national airs it does not occur, and whenever it does occur there is almost invariably a return to the original key before the air closes. A tune does not necessarily commence with the key-note, though it does so in the majority of instances; the other common starting notes are the third and fifth of the scale. Except in very rare cases a melody ends on its key-note.

Harmony.—A musical composition may consist of a series or progression of sounds so connected that several of them may be heard at the same moment. When several voices or instruments produce at the same instant sounds different in pitch so combined as to cause an agreeable sensation on the ear, the combination is called harmonious, and the proper method of combining these sounds is called the art of harmony. The series of notes taken by a single voice or instrument capable of producing only one note at a time is called a part, and in harmonized music there cannot be less than two of these. This number gives but imperfect harmony. Three parts are better, but four parts is by far the most common, and in fact the most satisfactory, as this number enables the harmony to be made quite complete, while by a skilful arrangement the parts, not being numerous, will make themselves each perfectly distinct to the ear. Beyond this the difficulty of composition increases considerably, yet five, six, seven, and eight parts are common in the ecclesiastical compositions and madrigals of the old masters. Indeed so skilful were the musicians of former days in this art that compositions of twelve, sixteen, twenty-four, forty-eight, and even ninety-six real parts are in existence. —In vocal music of four parts the upper part (which is almost always the melody) is generally given to the soprano, or treble, the highest female voice, the lowest to the bass, or lowest male voice; the higher of the intermediate or inner parts is given to the alto, or contralto, the lowest female voice, and the lower to the tenor, or highest male voice.

When two sounds heard together are agreeable to the ear they are called concordant, or are said to form a concord; if, on the contrary, they grate upon the ear they are said to be discordant, or to form a discord. The concord then may be said to be a harmonical interval, and the discord an inharmonical one; yet by the proper introduction of discords the harmonies of a passage receive a lustre and a value from the contrast. Any two sounds apart from each other by the interval of a major or minor third, a minor fourth, a perfect fifth, a major or minor sixth, or an octave, are concordant when heard together; at all other intervals they are discordant. Concords are of two kinds—perfect and imperfect. The perfect are the minor fourth, the perfect fifth, and the octave; the imperfect are the major and minor third, and the major and minor sixth. A perfect concord is so called because its conterminate sounds cannot be raised or depressed without becoming discordant. If three or more sounds be heard at the same time the combination is called a chord. When a chord is composed of concords only, or in other words when it

EXAMPLE XIV.

is composed of a fundamental sound accompanied by its third (major or minor) and its fifth, it is termed a common chord. The octave to any one or to all of the notes of the chord may be added, but it will still remain a common chord; as it does whether the fundamental note is placed highest or lowest of the series on the staff. (See Example XIV.) The common chord is subject to two inversions; thus in the scale of C the E may be placed lowest on the staff, and then the chord becomes what musicians call a sixth, as the fundamental or key-note is a sixth above it; in like manner G may stand lowest on the staff, when it becomes the chord of the fourth, or, as it is often called, the fourth and sixth. The common chord is shortly expressed $\frac{5}{3}$, $\frac{5}{6}$, or $\frac{8}{5}$, written under the bass; but in instrumental music, where these figures are employed, the absence of figures in a figured bass, as it is called, denotes the common chord. A common chord has more richness of harmony than any of its inversions; this arises from the want of the concord of the perfect fifth; the first inversion has a better effect than the second. In doubling the notes of a common major chord it is better to double the fun-

damental than the fifth, and the fifth should be doubled rather than the third; in the minor mode the third should be doubled in preference to the fifth, as minor chords are in themselves somewhat harsh, and are enriched by the added third, thirds being the source of sweetness in harmony. Of discords the most simple is the minor seventh, or, as it is usually called, the dominant seventh, because it is founded on the fifth or dominant of the scale; it requires the part in which it occurs always to descend one degree. (See Example XV. 1.) As in the common chord any one of these notes may be placed as the bass note of the chord, yet, as with C in the common chord, the fundamental note of it will be G, B being a third, D a perfect fifth, and F a minor seventh (Example XV. 2). In each of these cases it would carry the figure 7 below it. When B is taken as the bass note the inverted chord is made up of a minor third, an imperfect, flat or false fifth, and a minor sixth, and is figured $\frac{6}{5}$ (Example XV. 3). When D is taken as the bass note the chord is made up of a minor third, perfect fourth, and major sixth, and is figured $\frac{6}{4}_{3}$, or simply $\frac{4}{3}$ (Example XV. 4). When F is in the bass the chord consists of a major second, sharp fourth, and major sixth, and is figured $\frac{6}{4}_{2}$, $\frac{4}{2}$, or simply 2 (Example XV. 5). From these observations it appears, therefore, that the last three chords are properly called derivatives of the minor seventh when accompanied with a major third and perfect

EXAMPLE XV.

fifth. Besides the chords within the compass of the octave there is the ninth, which in four-part harmony is usually accompanied with the third and fifth, and is marked by the figure 9 (Example XV. 6). It is often, however, accompanied with a fourth and a fifth, and is marked by a double row of figures (Example XV. 7). In three-part harmony the fifth is not used. The ninth has two inversions, one figured with a seventh on the third of the fundamental note, the other figured with a fifth and a sixth on the fifth of the fundamental note. We will here exemplify the harmony of the scale, or the accompanying tones which produce harmony, with all the notes of an octave.

The different motions of the parts which constitute harmony may be parallel, direct (or similar), oblique, and contrary. Parallel motion is when two or more parts move in the same direction and remain at the same number of degrees distant; direct or similar motion is when the parts move in the same direction but do not remain at the same distance; oblique motion, either of the parts may be stationary while the

EXAMPLE XVI.

rest move in parallel or contrary directions; contrary motion is when the parts approach or recede from each other. It rarely happens that all the parts can move in the same way upwards or downwards together.

The principal rules with respect to the motion and succession of concords are: 1. Octaves and fifths must not be consecutive in parallel motion. Consecutive octaves produce a baldness of harmony and confusion of parts; consecutive fifths suggest to the ear the setting up of two distinct keys rather than two chords in one key. But these remarks do not apply to the continuance or repetition of the same notes, and a perfect fifth may be followed by a diminished fifth. Composers, when wanting to produce particular effects, however, sometimes employ a succession of octaves. 2. Unnecessary and distant skips should be avoided as much as possible, and the chords

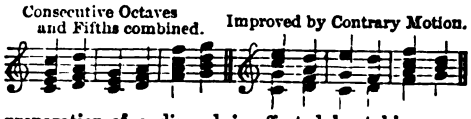
EXAMPLE XVII.

should be as close and connected as may be. 3. False relations, such as the extreme sharp second, should never be employed unless to express a particular effect. 4. The regular motion of the different parts must be observed: sharp intervals should ascend after the sharp, whilst flat intervals should descend after the flat. We may also observe that it is customary for compositions to begin with one of the concords of its key-note, and it should close in the key-note with the common chord as its harmony.

It still remains for us to treat of the harmonic use of the intervals; the reader, however, must not expect in the space of an encyclopedia article a complete development of the laws of harmony. For this he must consult some of the works mentioned at the close of this article. A piece of music harmonized throughout by concords would prove too cloying, and

to prevent this discords are introduced. Certain discords are very disagreeable if produced abruptly without preparing the ear to receive them. The

EXAMPLE XVIII.



preparation of a discord is effected by taking care that the discordant note is heard in the preceding consonance. As the ear would not tolerate a long succession of discords, it must be satisfied by a return to concords, which is called the resolution of a discord, which is effected by the part in which the discord appears moving upward or downward to the concordant note in the next chord, and the ear seems most generally satisfied when the discordant part proceeds to the nearest degree. In the interval of a second the lowest note is the discord, and may be prepared in any concord, but must descend to the resolution (Example XIX. 1). These seconds are called transient which are introduced without preparation on the accented part of the measure. When the second is attended by the fifth and third it produces a chord of four real parts, and retards the chord of $\frac{6}{4}$, or the $\frac{6}{5}$; and if the third be sharp the minor mode is indicated (Example XIX. 2). A chord of four real parts contains four sounds not octaves or unisons; a concord can have but three real parts. When the second is attended by the fourth or fifth either the fifth or fourth must be prepared, and it becomes the chord of the fifth and sixth at the resolution of the second by the bass (Example XIX. 3). The second accompanied with the sixth and fourth is a chord of four real parts, three of them forming a common chord above the bass, which being the discord is resolved by a descent to the next degree; the sharp fourth usually ascends (Example XIX. 4). The second is also accompanied with the fourth and sharp seventh, which, when introduced upon a resting bass, allow

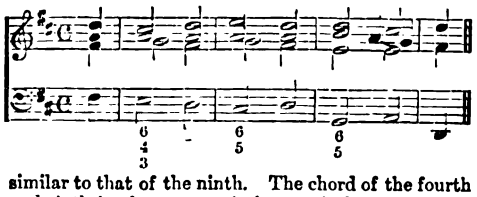
EXAMPLE XIX. 1—6.

all the intervals when struck to ascend (Example XIX. 5). If the bass moves the upper parts are usually prepared (Example XIX. 6).

The major or minor third is an agreeable concord; in succession two minor thirds are better than two majors; but mixed thirds in succession are most grateful to the ear. The third is sometimes accompanied by a fourth and sixth, and when the third is minor, the fourth perfect, and the sixth major, the chord is as elegant in effect as the seventh from which it is derived.

The fourth accompanied with the fifth is a discord very frequently employed. When introduced on a resting bass it resolves into the third; its effect is

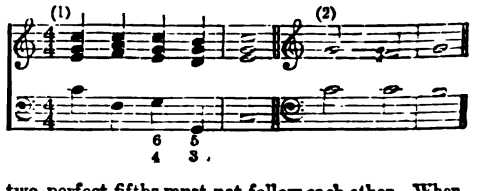
EXAMPLE XX.



similar to that of the ninth. The chord of the fourth and sixth is of great use in harmonical progressions, and when preceded by the common chord to the key-note and fourth of the key, and followed by the common chords of the dominant and tonic, it forms one of the terminations to a musical period called the fourth and sixth cadence (Example XXI. 1). When the seventh accompanies the fourth, and the latter is succeeded by the chord of the third, fifth, and seventh, either the fourth or seventh, or both, should be in some part of the chord preceding it. The fourth and seventh descend to the resolution and generally resolve after each other. The interval of the sharp fourth is of great use in modulation; but introducing it on the key-note, a change into the key of the dominant is effected. In four parts the sixth and second accompany it (Example XXI. 2).

In using the interval of a minor fifth the highest note falls and the lowest rises, thus meeting in a major third. In four-part harmony it is accompanied by a third and sixth. An imperfect fifth may succeed a perfect fifth, but as we have already observed

EXAMPLE XXI. 1, 2.



two perfect fifths must not follow each other. When any note moves to a fifth in similar motion there is said to be a hidden fifth in the passage, and this should be avoided. In a regular ascent it is common for a fifth to be succeeded by a sixth, as in a descent it is common for the seventh to be succeeded by a sixth. Of both these, which are called sequences, we give an example.

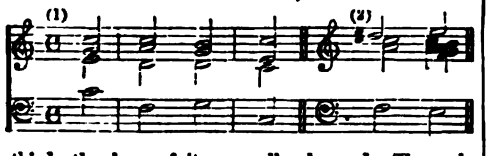
The extreme sharp fifth which is composed of two major thirds is treated as a passing note and always rises to the resolution. It is called a transient chord.

The sixth by inversion becomes a third, and it frequently happens that the bass which accompanies sixths will harmonize equally well with thirds. When

EXAMPLE XXII.

the sixth is accompanied with a fifth the latter is treated as the discord (Example XXIII. 1). A species of this chord much used in minor keys consists of a perfect fifth, an extreme sharp sixth, and major

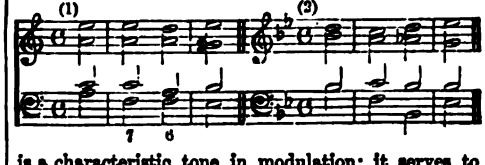
EXAMPLE XXIII. 1, 2.



third; the bass of it generally descends (Example XXIII. 2).

The major seventh accompanied with a third major and a perfect fifth is a very agreeable discord; the seventh should be prepared in the preceding chord, and should be resolved by descending (Example XXIV. 1); but if the major seventh is accompanied with the second and fourth, it resolves upwards on the octave. The flat seventh, like the sharp fourth,

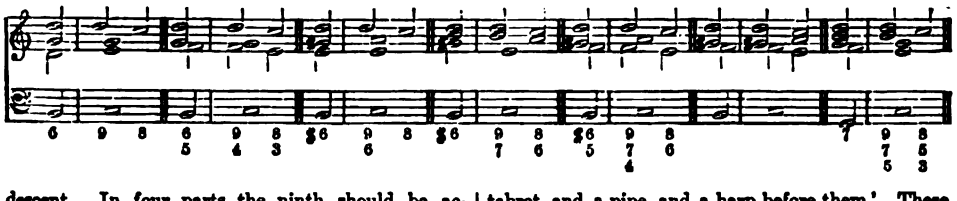
EXAMPLE XXIV. 1, 2.



is a characteristic tone in modulation; it serves to lead into the key of the subdominant (Example XXIV. 2).

The ninth major is a whole tone and the ninth minor a semitone major above the octave. Both are prepared in the preceding chord and resolved by

EXAMPLE XXV.



descent. In four parts the ninth should be accompanied with the third and fifth, and must be accompanied at the resolution by an eighth (Example XXV.)

The ninth may have other discords (as the fourth and seventh) mixed with it; in which cases the fourth and seventh must be separately prepared and resolved. To the subject of counterpoint we have devoted a separate article, and it now only remains for us to give a short outline of the history of music.

History.—The first public use of music by every people has been in religious rites and ceremonies. The means presented by this art of amplifying and prolonging ceremonial; of raising and sustaining in great multitudes a similar state of feeling; above all, of giving simultaneous expression to this feeling, be it what it may—these qualities have at all times recommended music to those on whom the arrangement of rites and ceremonies has fallen. There are few materials in the Old Testament or other trustworthy writings of the ancient Hebrews for obtaining a satisfactory account of the music of the Jewish people, whose restricted intercourse with other nations prevents our receiving it from contemporary writers. One of the oldest songs on record is that which Miriam sang, with instrumental accompaniment, at the crossing of the Red Sea. In 1 Samuel x. 5 the prophet says to Saul: 'Thou shalt meet a company of prophets coming down from the high place, with a psaltery, and a tabret, and a pipe, and a harp before them.' These prophets were, in all probability, improvisatori of verses which they sang to accompaniments, and many authorities have supposed that the Jews had a school of prophets which was also a school of music, for they almost invariably sang to accompaniments, played by themselves or by others. At the time of David and Solomon music had reached its highest perfection among the Hebrews; great corps of musicians were appointed for the celebration of religious ceremonies. For some time before the destruction of the temple and the first Babylonish captivity, the sacred rites and music were interrupted both on account of war and intercourse with other nations. The subsequent inroads of Babylonians, Egyptians, Persians, and Romans, left the Jews no opportunity to cultivate the arts. Coming down to the Christian era we find that all music was excluded from the synagogues ever since the destruction of Jerusalem. According to a passage in one of their prophets, it is contrary to law, or at least improper, to sing until the coming of the Messiah. At the present day it is only the German Jews who have a regular musical establishment in their synagogues. They sing in parts, and several traditional melodies have been preserved, which are held to be very ancient. Among the ancient Egyptians the profession of music, like all others, was hereditary. We learn from Strabo that the youth were instructed at the earliest age in the art, that the songs were fixed by law, and that the

[illegible] Athenians dedicated a temple [illegible]

[illegible] Ambrose to compose and adapt music to the different portions of the church service, so as to determine and define—almost to form

—the musical idiom in which it was to be cast; he had to select from the exceedingly complicated system of the Greeks a set of scales few and simple enough for the use of a very rude people. His reputation has, however, been somewhat obscured by the next great musical reformer, Gregory the Great, whose epoch is fully two centuries nearer our own. During this long period the institutions of Ambrose fell, as might be expected in such an age, into utter confusion. Gregory began his reform of ecclesiastical music by gathering together what remained of the labours of Ambrose and others, intending to cast them into an antiphonary, or authorized body of sacred music. He would seem early in his labours to have found that the Ambrosian scales were too few, and of too limited extent to admit without mutilation of numerous compositions which might seem fitted for his purpose. He therefore supplemented the Ambrosian scales, then first designated authentic, four other subordinate or collateral scales called plagal. (See GREGORIAN TONES.) From this time, even until now, not only have the chants for the Psalms, still in extensive use, borne the name of Gregory, but every variety of *plain-song* is popularly called Gregorian music. During the four centuries which connect the epoch of Gregory with that of Guido Aretino, the next great musical reformer, only two names are worthy of mention, those of Isidore, archbishop of Seville, in whose Sententiæ de Musica we meet, for the first time at least among Christian writers, with the mention of harmony in the modern sense of the term. He mentions two kinds, symphony and diaphony; by the former he would seem to have meant a combination of consonances, and by the latter of dissonances. Hucbald, a monk of St. Armand, Tournay (died 932), not only mentions harmony, but gives examples of the harmony of his age, diaphony or organum. In his treatise on music the melody is called the vox principalis or simply principalis; the added part the vox organalis, or organalis. A principalis could be accompanied—1st, with the octave above or below; 2d, with the fifth above; 3d, with the fourth above; 4th, with the fourth above and the fifth below; 5th, with the fifth above and the fourth below. The name we have now to mention is the greatest of the early middle ages, Guido Aretino. (See ARETINO, GUIDO.) He has been popularly credited with the invention of the scheme of designating by points distributed upon lines and spaces the different sounds of the scale, an invention which, however, is claimed for two Frenchmen a century earlier. The names which he gave to the notes, *Ut* (for *Do*), *Re*, *Mi*, *Fa*, *Sol*, *La*, are universally understood and extensively used to this day. *Si* was afterwards added by a musician named Le Maire. Within fifty years after the death of Guido a new form of musical art made its appearance, the characteristic of which was the combination of sounds of unequal lengths—music in which two or more sounds succeed one another, while one equal to them in length was sustained. This was called *discantus*, or descant. Descant, it is obvious, would argue the existence of some system of musical proportion among sounds of different duration, and written descant some means of distinguishing such sounds from one another. As might be expected, we hear of both inventions about the same time, the middle of the twelfth century, when the treatise on the Cantus Mensurabilis of Franco of Cologne was written, when notes appear first to have been used, and signs to represent the raising and depressing of individual sounds (flats and sharps) first came into being. Late in the thirteenth century we hear of a Trouvère, not only a poet and melodist, but also a veritable composer—Adam de la Hale, the Hunchback of Arras as he was called, born in 1240. He was the composer of several three-part songs, somewhat rude in structure, it is true, but greatly in advance of that of any preceding or contemporaneous music; and also of the first comic opera, Li Gieus de Robin et de Marion. The beginning of the next century furnishes us with a remarkable evidence of musical advancement, in the word *contrapunctum* (point against point, or as we now say, note against note). This word was first used instead of the word discantus in the works of Jean de Muris, the greatest theorist of the fourteenth century. Its appearance in many treatises of the same time shows that points or musical notes were then pretty generally accepted as the symbols of musical sounds. The middle of the century gives us the first example of four-part music, in a mass peformed at the coronation of Charles V. of France (1360) and composed by Guillaume de Machault. By this time the organ must have reached some degree of mechanical perfection, for we find a certain Francesco Landino, a Florentine, distinguishing himself greatly in the fêtes given by the Venetian Republic in honour of the King of Cyprus in 1364. Landino attained also a high reputation as a composer, and some of his songs recently brought to light show that this reputation was well deserved. About this epoch we find the musicians of Belgium springing into notice. It has been ascertained from the records of the pope's chapel that several Belgian musicians visited Rome in the last years of the fourteenth century, carrying with them, along with other music, the first masses that had ever been seen there in written counterpoint. In the list of these singers we find the name of Dufay, who was a singer in the Pontifical chapel in 1380. His compositions, at least in sacred music, are of a grave, grandiose stamp, harsh in places to our modern ears, but far superior in design and clearness of texture to anything known to be produced by his predecessors. But the works of Dufay and his contemporaries have been cast into the shade by those of a later generation, of the masters of the new Belgian school, Ockenheim, his contemporaries and pupils. Musical composition of any real value does not consist in an unintermittent presentation of phrases embodying new thoughts, but in the development, the pursuit to their ultimate consequences, of a few thoughts, sometimes even of one; technically, making the same passage heard successively in various scales, in various parts, and under various forms of accompaniment. This art, exemplified in canon, fugue, and imitation, was practised by Dufay, but greatly improved by Ockenheim. Great as the latter undoubtedly was as a composer, he interests us more as a teacher. His best works were his pupils, and among these was the musician with whose name the last years of the fifteenth and the first of the sixteenth century are commonly associated in musical history, Josquin Deprès, or Del Prato. (See JOSQUIN DEPRÈS.) His works drove those of every other composer from the churches of Italy, Spain, France, Germany, Flanders, and Hungary. Greatest and most prolific in the greatest style, he was no less delightful, to his public at least, in productions of a lighter class. He was more learned in the science and more skilled in the art of music than any of his predecessors or contemporaries. Shortly afterwards we meet with the pupils and countrymen of Josquin in every court and import city of the Continent. Tinctor, Garnier, and Hyart laid the foundation of a school at Naples, destined afterwards to take precedence for a time of all others; Gombert became chapel-master to the Emperor Charles V.; Mouton held the same office at the court of Francis I.; Genet found such favour with Pope Leo. X. that he made him a bishop *in partibus*,

and sent him to France on a special mission as legate: Henry Isaac was at Florence composing masses for the church of St. Giovanni, and carnival songs for Lorenzo de' Medici; Willaert founded the musical school of Venice. Notwithstanding the number of Belgian masters who visited and taught in Italy in the end of the fifteenth and beginning of the sixteenth century, no regular music school was opened in Rome before 1540. Many Italians, however, had profited in some way by Belgian instruction. Constanzo Festa, at the time of his death, had attained considerable reputation. He is one of the creators of the madrigal; and a Te Deum of his has been sung on the election of every pope since his time. Equally famous too were the brothers Giovanni and Paulo Animuccia, the former being specially interesting to us from his connection with St. Filippo de Neri, a connection to which may be traced the origin of the oratorio (which see). The first Roman school was founded by Claude Gondimel (1510-72). His masses and motets, composed before his conversion to Protestantism, are numerous and excellent. He arranged the music to the metrical psalms of Marot and Beza; and in the department of secular art he set a selection of the odes of Horace. Among his pupils was the greatest composer the world had yet seen, Giovanni Pierluigi Palestrina (1524-94). (See PALESTRINA.) Musical learning had done its utmost. Every kind of contrapuntal artifice had been brought into play; no attempt was made to bring out the meaning of the words, to give them force, or to make them intelligible. The theorists had had their own way, and the ears of the listeners were wearied with the incessant chasing of fugue, canon, and imitation, while the heart remained untouched. All these elaborate compositions, too, were built upon borrowed themes, often fragments of well-known secular melodies; and not only was the music employed, but the words were also bodily transported. These evils came under the censure, first of the Council of Basel, and then of the Council of Trent, and the committee appointed to carry out the decrees of the latter deputed Palestrina the hard, and at that moment all important, task of showing that his favourite art was worthy of the closest union with the grandest inspirations of the poet. He produced three masses, the first two of which created an enthusiasm altogether without precedent, while the third, the Missa Papæ Marcelli at once saved music to the church, and established a type, which all the changes in the musical art since his day have failed to render less precious. The only master whose name is really worthy of mention beside his is the Belgian Orlando di Lasso, yet we can scarcely pass unnoticed the name of Luca Marenzio, in whose hands the madrigal reached its highest perfection. One thousand compositions of this kind are said to have been produced by him.

There is every reason to believe that at this period great musical skill and knowledge extended over every part of civilized Europe. Spain had, early in the sixteenth century, furnished the Italian choirs with excellent voices. In Protestant Germany the influence of Luther, no mean musician himself, had been brought to bear on the cultivation of the higher branches of the art, nor was it less honoured in Catholic Germany. Duke Albert of Bavaria maintained a choir of sixty-two singers and thirty instrumentalists in his chapel at Munich, of which Orlando di Lasso was director. The Italians, however, were now, as the Belgians had been before, at the head of the art, and were its chief masters and interpreters throughout Europe, with the single exception of England, which in this sixteenth century had a strictly national school worthy of the country. Tallis, Byrd, Farrant, and Bevin, in church music; Morley, Ward, Wilbye, and Weelkes, in the madrigal; Bull, excellent in performance as in composition; Dowland in the part song; and last and greatest in all styles, Orlando Gibbons—these are names to which the English musician may refer with proud confidence as worthy of being associated with those of Palestrina, Marenzio, and Lasso. The close of the century witnessed the birth of another species of musical composition, the Opera seria. It is true some faint approaches had been made in this direction before, the most notable of which are the Orfeo, performed for the entertainment of Cardinal Gonzaga, at Florence, in 1475; a pastoral drama by Alfonso della Viola, Il Sacrifizio, performed at the court of Henry II. of France in 1555; and in 1574 an opera by Zarlino, said to have been performed when Henry III. passed through Venice on his way from Poland to France after the death of Charles IX. There can be no doubt but that these works were composed with little or no attempt at dramatic colouring or expression of the sense of the words. About the year 1580, however, a number of amateurs living in Florence formed themselves into a society for promoting the closer union of the arts of poetry and music by the revival of the musical declamation of the Greeks. The leading spirits of this society were Bardi, Corsi, Strozzi, Galileo (the father of the astronomer), and others. The result of the association's labours was a setting of the episode Ugolino, from Dante's poem, by Galileo; the Satiro and the Disperazione de Fileno, by Emilio del Cavaliere; Dafne, a pastoral, set by Peri to words by Rinuccini; and a lyric tragedy, Il Morte di Euridice, by Peri and Caccini. But all these were soon surpassed by the works of Claudio Monteverde. His Orfeo opened up a new musical world. His melody was more symmetrical, his harmony purer, his rhythm more marked, and his instrumentation fuller and more varied than had been ever heard before. (See OPERA.) If he was not the first to invent the perfect cadence, he was certainly the first to appreciate its importance, and to turn it to good account. Many progressions and combinations first proposed by him have now found universal acceptance. The first to profit by the discoveries of Monteverde was an artist born some twenty years later—Carissimi, the first great master of the sacred cantata in its various forms. In his oratorio of Jephtha, his choruses are grand and noble, but have been surpassed by those of his successors, who have had the good fortune to have had them for a point of departure; but in the recitative Carissimi has never been surpassed. He is said to have been the teacher of Alessandro Scarlatti, the founder of the Neapolitan school. With this school begins modern musical practice: better methods of fingering the keyed instruments, and of bowing the stringed instruments, not to speak of improvements in the instruments themselves; and above all these in importance and difficulty, the art of singing.

The history of the French school proper begins late in the seventeenth century, with J. B. Lully, born at Florence, 1633. He must have left Italy too young to have profited by the instruction of any of the excellent instructors who then abounded, and musical science and skill did not exist in France when he must have most needed their example and help. Yet he became, certainly not one of the greatest, but one of the most popular composers of any age, and what is extraordinary in a self-taught man, one of the best instrumental performers of his day. His industry was enormous; he composed twenty grand operas, numerous ballets carried on entirely by music, and of occasional music in divertissements and other theatrical pieces (many of which

were written by Molière); and though not so numerous, compositions for the church. Though his music never had great popularity beyond France, yet the influence of his example was extensive. Pelham Humphreys was sent by Charles II. to receive instruction from him, and though the pupil did not live long to profit by his instruction, there can be no doubt but that the master's ideas were followed out by his fellow-students, Wise and Blow, and by those of their immediate successors in the English Chapel Royal, the most distinguished of whom was Henry Purcell, who has been regarded by all musical authorities as the type of English composers. His compositions were for some years after his death the chief music heard in England. Dr. Arne had, indeed, succeeded in obtaining a hearing; and the works of Croft and Green occupied the choristers of our cathedrals; but a new era was opened by the advent of Handel, so large a portion of whose life was spent in England, and so large a portion of whose music is due to English suggestion, that he has come to be universally looked upon as more than half an Englishman. See HANDEL and ORATORIO.

In the early part of the eighteenth century Germany began to make for herself a place among the musical nations of Europe, and from about the middle of the last century, when the career of J. Sebastian Bach ended, that place has been indisputably the highest. In every department of the musical art but one—singing—the German school has equalled, we might venture to say, surpassed, all others. Under its hands instrumental music has been so developed, and has taken forms so extensive and various, that a new world may be said to have been opened to musical Europe. It cannot be denied that Germany owes much to her southern rival, Italy. Gluck, Haydn, Mozart, Emmanuel Bach, and many others, before and after, owe much of the sweetness which they united with German strength to their study of the Italian masters; and in turn, Beethoven, the Shakspere of music, was greatly influenced by the works of those his immediate predecessors. By the time we reach Weber, Spohr, and Mendelssohn, all traces of the southern influence are hidden. Although the French musical drama owes its origin to the Italians, its consolidation is the work of the Germans. Indeed, altogether the French opera is the most composite, anomalous, and wonderful of all creations. All schools are represented in it. Springing up with Lully, a Florentine, carried a step forward by Rameau, a Frenchman, it was subsequently developed by Gluck and Meyerbeer (Germans), by Cherubini and Rossini (Italians), and by Mehul, Boildieu, Herold, and Auber (Frenchmen). Against the best works of the German masters, those of the purely sensuous Italian school, represented by Donizetti, Bellini, and Verdi, have striven with some success for popularity, but the tide of victory seems fairly turned away from the pleasant productions of the sunny south. In the higher walks of music English composers have hardly obtained a hearing beyond their native shores. The strains of Balfe occasionally fall upon the ears of the frequenters of continental theatres, it is true, but for the present British musicians must for the most part be content to submit themselves to the verdicts of audiences of their countrymen. Of the influence of the school headed by Richard Wagner it is too early yet to speak with any certainty. That the works of that great representative of the 'music of the future' display strength, breadth, and colour, cannot be denied, no more than that they often offend by intolerable harshness the ears of many of the best-trained musicians of Europe.

For further particulars on the science see Helmholz's Lehre von den Tonempfindungen; Professor Tyndall, On Sound; on the theory, Dr. Calcott's Musical Grammar; Dr. Marx's Allgemeine Schule der Musik; on the history, Hawkins' and Burney's History of Music; Chappell's History of Music; Engel's Music of the Most Ancient Nations.

MUSIC OF THE SPHERES. See HARMONY OF THE SPHERES.

MUSK-DEER (*Moschus*). This genus of deer forms the type of the family *Moschidæ*, which is to be regarded as essentially distinct from the family of the Cervidæ, or true Deers. The family Moschidæ is included in the section Ruminantia of the order of Ungulate or 'Hoofed' Quadrupeds. In the Musk-deers horns are wanting in both the males and females; and the 'lachrymal sinuses' or 'larmieres'—sebaceous glands secreting an odoriferous waxy substance, and placed beneath the eyes—characteristic of the Cervidæ, are wanting in the Musk-deers. In form the latter are deer-like. They are all of small size, and are light and agile in their movements. They are gregarious in habits, and are found chiefly in Asia—India, China, and the islands of the Eastern Archipelago being the head-quarters of distribution of the family. A species occurs on the west coast of Africa also. Canine teeth are present in both upper and lower jaws in the Musk-deers, and the upper canines are specially developed in the males, to form tusk-like structures. The typical species of the family is the celebrated Musk-deer (*Moschus moschiferus*), found chiefly in the elevated plateaux-lands of Central Asia, and particularly of Thibet, but extending northwards also. These animals attain the size of a young roe-deer, and are among the largest members of the family. The upper jaw, with its prominent canine teeth, projects considerably. The muzzle is destitute of hairs. The ears are elongated and narrow. The hair of the body is inelastic, long, and erect; and the hairs are each marked with bands of colour, beginning with a cinereous hue at the root of the hair, to which succeeds a black tint, the tip of the hair being of a ferruginous or reddish colour. The hoofs are deeply cleft, and are coloured black. The tail is short. The males alone yield the *musk* secretion, which is furnished by a glandular sac or pouch situated on the abdomen, and averaging the size of a hen's egg. The secretion is unctuous when contained within the sac, but becomes granular and of a dark colour when dried. About 190 grains is stated to be the average quantity obtained from a single animal. When the musk-sac is first opened the odour is said to be so powerful that it causes the mucous membrane of the nose to bleed (Tavernier). The bag is cut off by the hunters, and its orifices tied, but they are said to adulterate it largely—a process easy of performance, and somewhat difficult of detection. The musk-deer is of a timid nature, and inhabits inaccessible crags, leaping and jumping with great agility. The autumn season is that most favourable to their capture, as at that time these animals assemble in large herds, apparently prior to their southward migration. Musk, as sold in commerce, may be bought under two names or forms. The Tonquin or Thibet musk is that most in repute, and is brought from Tonquin and Cochin-China. The musk-bags are packed in boxes lined with lead, each bag weighing from ½ oz. to 2 oz. The second or inferior quality of musk is that known as the Siberian, Russian, or Kabardinian kind. The annual import of musk into Britain averages upwards of 10,000 oz. Musk is used medicinally as an antispasmodic, and familiarly as a perfume.

Other species included in this family are the Kubaya (*M. Sibiricus*) of Siberia; the *M. leucogaster*,

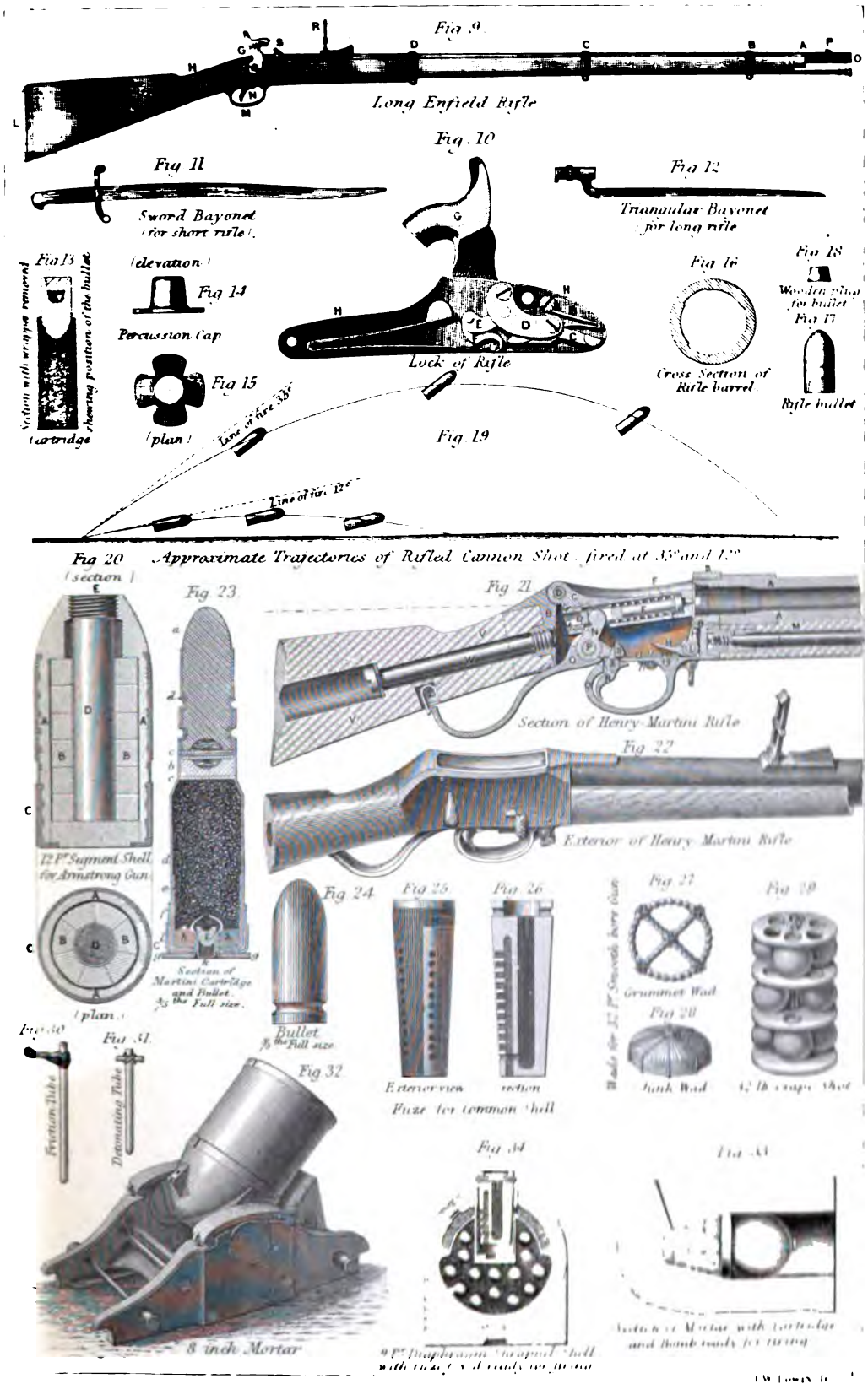
or White-bellied Musk-deer, and the Golden-eyed Musk (*M. chrysogaster*), both found in Nepaul. The *M. Javanicus* of Java wants the musk-sac, and averages the size of a large hare. And in the diminutive Kanchil (*Tragulus pygmæus*) of the Eastern Archipelago, the smallest existing Ruminant, the musk-sac is also wanting. The *M. aquaticus* occurs on the West African coast, and the *M. Memimna* is found in Java and Ceylon. The American Musk-deer (*M. Americanus*) is a true deer (*Cervidæ*), and not one of the *Moschidæ;* and the *M. delicatulus* of Shaw is the fawn of the American stag. See also MUSK-OX and MUSK-RAT.

MUSKET, a general term for any hand-gun used for military purposes. According to its original application *musket*, or *musquet*, denoted a firearm discharged by means of a lighted match, and so heavy that it required to be laid across a staff or *rest* previous to being fired. A musket consists of three parts: the barrel, the lock, and the stock; the first being the tube along which the ball is propelled; the second, the apparatus attached to the breech of the barrel, which serves for discharging the piece; and the third, the wooden framework which supports the barrel and the lock. In the manufacture of gun-barrels a considerable variation takes place according to the quality and price which it is wished that each should respectively bear. The common cheap description of barrels is made by simply rolling up a long strip of iron, and then welding the edges together on a mandril. For the more expensive barrels, and where a greater degree of strength is desired, a rod of iron is twisted into the form of a corkscrew, with the convolutions, however, close together instead of open; the twisted metal is then made to *jump* or close together by being set upright and struck by a hammer. Other pieces are then welded on successively to the first rod, till the barrel is complete in its entire length. The strength of the barrel increases in proportion to the narrowness of the rods out of which the twist is formed, the breadth of these in the finest barrels not exceeding $\frac{6}{70}$th, and the thickness $\frac{6}{70}$th of an inch. The barrels of government rifled muskets are not made thus, but are either formed from a slab of wrought iron termed a 'skelp,' which is gradually bent round between grooved rollers, welded on a mandril, and drawn out; or else they are made of steel drawn out and bored. Musket stocks are made of walnut wood. The British musket of the days of the Peninsular war and Waterloo, with its flint-lock, was succeeded by the percussion musket commonly called 'Brown Bess' in 1842. This had a smooth bore ·733 inch in diameter, throwing a spherical ball of 490 grains weight. Its fire was considered to be effective up to about 200 yards, but its shooting was very wild. The Brunswick two-grooved rifle with belted ball was little better. In 1851 the first rifle firing an elongated bullet came in under the name of the 'Minié.' It was succeeded in 1853 by the well-known 'Enfield Long Rifle' with three grooves. (See Pl. CXXXIII. figs. 9, 10, &c. In fig. 9, A is nose-cap of stock; B, upper band; C, middle band; D, lower band of stock; E, swell; F F, projection of stock; G, head of stock; H, small of stock; K, butt; L, heel-plate; M, trigger guard; N, trigger; O, muzzle; P, fore-sight; R, back or elevating sight; S, nipple. In fig. 10, which shows the details of the lock, A is main-spring; B, scar-spring; C, sear; D, bridle; E, tumbler; F, swivel; G, hammer; H, lock plate.) The 'Short Enfield' with five grooves came in 1856. The Lancaster and Whitworth existed also, but can hardly be looked upon as having been regular service arms. All these were muzzle-loaders, but in 1866 the Snider system of converting muzzle-loading arms into breech-loaders came in. It consists in replacing the breech end of the barrel by a thick 'shoe' of iron in which is a hollow groove in prolongation of the barrel proper. Into this shuts down a close-fitting block of iron, working on a hinge. A plunger with a spiral spring runs obliquely through this breech block, one end meeting the axis of the barrel, the other taking the place of the old nipple, so as to fall under the blow of the hammer. By this simple means the cock, and indeed the whole of the old arm, was rendered available except a small piece of the breech end of the barrel. A few minor parts, including an extractor and two springs, also exist, but need not here be described. The motions in loading and firing this arm after the discharge of a previous round were as follows:—1st, Cock; 2d, (a double motion) open breech block and extract; 3d, insert cartridge; 4th, close breech block; 5th, pull trigger. It is quicker to use than the chassepôt or needle arm. Its ammunition is the Boxer central fire metal cartridge. It is deadly at fair ranges, but the bullet is carried rather wide in a high wind. In penetration it spreads and tears itself open.

The rifled musket approved for the British arm of the future is the Martini-Henry rifle. The breech-action is remarkably complete and rapid in working (see fig. 21). In this rifle the breech is closed by a block C C, which is hinged on a pin D passing through the upper rear end of the 'shoe,' the recoil being taken by the 'shoe.' This breech-block contains a direct-acting piston or striker E, which explodes the cartridge by the force of a strong spiral spring F passing round it. The bottom of the breech-block is slotted to allow the tumbler N to act on the striker. The breech-block is raised or lowered by means of a hand lever O behind the trigger guard, moving on the same axis-pin P as the tumbler. It is lowered when the lever is pressed down, and this motion also forces the tumbler back, compresses the main spring so as to place it ready for acting again, and likewise extracts the empty cartridge-case by the impact of the block on the lower arm of the extractor H. By drawing the lever back the block is raised and the breech closed, the arm remaining cocked or ready to fire. The plate shows the position of the parts after impact of the striker has taken place, and before the block has been lowered to let a new cartridge be inserted. To show whether the rifle is cocked or not an indicator is attached to the end of the tumbler axis, which appears outside, and as it moves with the axis shows in what position the tumbler is. There is also a safety-bolt which engages with the tumbler-rest S, and prevents it being moved by the trigger R. The tumbler-rest serves to relieve the trigger from the whole weight of the tumbler and main-spring. When the trigger is pressed its first movement relieves the tumbler from the tumbler-rest; the whole weight of the tumbler is now on the trigger, which, by additional pressure, is altogether relieved. (Additional reference letters not explained are A A, barrel; B B, body; G, stop-nut; I, extractor axis-pin; J, rod and fore-end holder; K, rod and fore-end holder screw; L, ramrod; M, stock, fore end; Q, trigger plate and guard; T, trigger and rest axis-pin; U, trigger and rest spring; V, stock-butt; W, stock bolt-washer; Z, lever catch-bolt spring and pin; *a*, locking-bolt; *b*, thumb-piece.) The action of the extractor is worthy of particular notice. The breech block first strikes the tip of the lever not at its extreme corner, but a little way down. Then the breech block, which is acting as the counter lever of a lever of the first order, is shortened, while the extractor lever, which is acting as a lever, is lengthened, so that great power is obtained to detach the cartridge. As the breech block comes further down, its corner comes into contact with another part of the

MUSKET. MORTAR. SHELL. &c.

PLATE CXXXIII



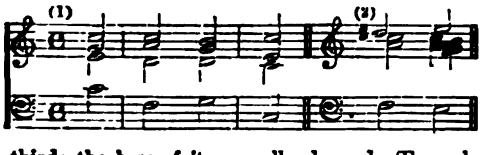
The extreme sharp fifth which is composed of two major thirds is treated as a passing note and always rises to the resolution. It is called a transient chord.

The sixth by inversion becomes a third, and it frequently happens that the bass which accompanies sixths will harmonize equally well with thirds. When

EXAMPLE XXII.

the sixth is accompanied with a fifth the latter is treated as the discord (Example XXIII. 1). A species of this chord much used in minor keys consists of a perfect fifth, an extreme sharp sixth, and major

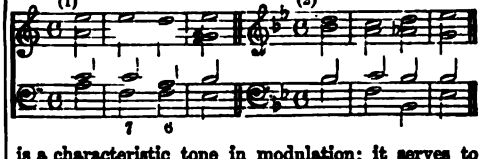
EXAMPLE XXIII. 1, 2.



third; the bass of it generally descends (Example XXIII. 2).

The major seventh accompanied with a third major and a perfect fifth is a very agreeable discord; the seventh should be prepared in the preceding chord, and should be resolved by descending (Example XXIV. 1); but if the major seventh is accompanied with the second and fourth, it resolves upwards on the octave. The flat seventh, like the sharp fourth,

EXAMPLE XXIV. 1, 2.



is a characteristic tone in modulation; it serves to lead into the key of the subdominant (Example XXIV. 2).

The ninth major is a whole tone and the ninth minor a semitone major above the octave. Both are prepared in the preceding chord and resolved by

EXAMPLE XXV.

descent. In four parts the ninth should be accompanied with the third and fifth, and must be accompanied at the resolution by an eighth (Example XXV.)

The ninth may have other discords (as the fourth and seventh) mixed with it; in which cases the fourth and seventh must be separately prepared and resolved. To the subject of counterpoint we have devoted a separate article, and it now only remains for us to give a short outline of the history of music.

History.—The first public use of music by every people has been in religious rites and ceremonies. The means presented by this art of amplifying and prolonging ceremonial; of raising and sustaining in great multitudes a similar state of feeling; above all, of giving simultaneous expression to this feeling, be it what it may—these qualities have at all times recommended music to those on whom the arrangement of rites and ceremonies has fallen. There are few materials in the Old Testament or other trustworthy writings of the ancient Hebrews for obtaining a satisfactory account of the music of the Jewish people, whose restricted intercourse with other nations prevents our receiving it from contemporary writers. One of the oldest songs on record is that which Miriam sang, with instrumental accompaniment, at the crossing of the Red Sea. In 1 Samuel x. 5 the prophet says to Saul: 'Thou shalt meet a company of prophets coming down from the high place, with a psaltery, and a tabret, and a pipe, and a harp before them.' These prophets were, in all probability, improvisatori of verses which they sang to accompaniments, and many authorities have supposed that the Jews had a school of prophets which was also a school of music, for they almost invariably sang to accompaniments, played by themselves or by others. At the time of David and Solomon music had reached its highest perfection among the Hebrews; great corps of musicians were appointed for the celebration of religious ceremonies. For some time before the destruction of the temple and the first Babylonish captivity, the sacred rites and music were interrupted both on account of war and intercourse with other nations. The subsequent inroads of Babylonians, Egyptians, Persians, and Romans, left the Jews no opportunity to cultivate the arts. Coming down to the Christian era we find that all music was excluded from the synagogues ever since the destruction of Jerusalem. According to a passage in one of their prophets, it is contrary to law, or at least improper, to sing until the coming of the Messiah. At the present day it is only the German Jews who have a regular musical establishment in their synagogues. They sing in parts, and several traditional melodies have been preserved, which are held to be very ancient. Among the ancient Egyptians the profession of music, like all others, was hereditary. We learn from Strabo that the youth were instructed at the earliest age in the art, that the songs were fixed by law, and that the

MUSK-RAT (Musquash). The popular name of 'musk-rat' appears to have been applied to two distinct genera of animals. There is firstly the Musquash, or 'Canadian musk-rat' (*Fiber Zibethicus*) of North America, hunted for the sake of its skin; and secondly, the Desmans (*Mygale*), or musk-rats of Europe, included in the order Insectivora and in the family Soricidæ or Shrews of that order. The *Sorex Indicus*, or musk-rat of India and Africa, also classified with the Shrews, forms another example of the so-called 'musk-rat' genus.

Of these various animals the first-mentioned may be omitted from the category of true or special musk-producing forms. Its commercial importance is derived from the value of its fur, from 400,000 to 500,000 of the skins of these animals being annually imported into Britain. The musquash belongs to the order of Rodents, and forms a genus of the Castoridæ or Beaver family. It has a thick blunt nose and short ears, which are almost concealed in its fur. The colour of its body is reddish-brown; the belly and breast are of an ash colour, slightly mixed with a ferruginous tint. The hair is soft and glossy, and beneath it is a thicker layer of fur which is much used in the manufacture of hats. On the hinder feet, instead of the web connecting the toes, as in the beaver, there is a stiff fringe of hair, which is closely set, and projects from the sides; the front toes are free and unconnected. The tail is thin at the edges, and compressed, covered with small scales, with a few scattered hairs. It measures about 9 inches long, or is nearly the length of the body, which is 12 inches. The flesh is not eatable from the strong odour of musk which pervades it. The musk-rat is exceedingly common in most parts of the United States of America, particularly in the Northern. In Carolina, Georgia, &c., Bartram states that it is never found within 100 miles of the sea-coast. These animals reside along small streams, mill-races, and ponds, apparently forming their habitations according to the nature of the locality. Where the banks have some elevation they form large and extensive burrows, which have entrances below the surface of the water, and gradually ascend till they terminate in a chamber above the level of high water. These burrows are most frequently made under the roots of trees, or in other situations of difficult access. The excavations are of great injury to artificial embankments along canals and rivers, by permitting the water to undermine and to make large breaches in them. When, however, these animals inhabit low and marshy situations, they construct houses not very unlike those of the beaver, composed of reeds, &c., mixed with clay. These houses have several subterraneous passages leading to them, and are inhabited by many individuals during the winter; but in the warm weather they desert them entirely, and dwell in pairs whilst they rear their young, of which they have from three to six at a litter. The houses are constructed in the marsh or swamp, but not in the stream or pond, and a new home is erected every season. Hearne says that the tops of these houses are favourite breeding places for the geese, which bring forth their young there without the fear of being molested by foxes or any other destructive animal except the eagle. He also states that on Hudson's Bay, instead of making their houses on the banks of the water, they build them on the ice, always taking care to leave a hole to permit them to dive for their food. When the weather is so severe as to freeze these holes, and they suffer from hunger, there is strong reason to believe that they prey on each other. Their usual food is the roots, &c., of aquatic plants, particularly the calamus; they also destroy immense quantities of the different species of fresh-water mussels (*Unio*), the shells of which are always to be seen about the entrance of their burrows. They will also feed on fruit, and one of the common baits used in traps for them is an apple. They swim remarkably well, and are capable of remaining under water for a considerable time. They usually come forth in the night, generally remaining in the burrows during the daytime.

The insectivorous desmans include the *Mygale pyrenaica* of the Pyrenees, and the *M. moschata*, found in Russia. The nose in these animals is prolonged to form a short proboscis. The feet are webbed, and are destitute of hairs. They inhabit the banks of rivers, and swim well. They subsist on insects, small fishes, frogs, &c. Like the musquash, these forms exhale a very strong odour of musk, the Russian species being of the two the most celebrated in this respect. The musk-rat of India (*Sorex Indicus* or *myosurus*) (Pallas) averages the size of the common rat. This species is also found in Africa. The odour of musk exhaled by this latter form is said to be so powerful that it impregnates every article touched by it with the perfume; and it has been alleged, although the statement must be received with reserve, that wine has been rendered unfit for drinking by the animal having touched the cork of the bottle, and by the wine having in this way received a strong flavour of musk.

MUSLIN, a fine cotton fabric, of an extremely light and soft texture, not so compact as calico, and differing from gauze in being woven with untwisted yarns. The name is said to be derived from the city of Mosul in Mesopotamia, and it would hence appear that the city of Mosul was at one time a great seat of the muslin manufacture, although no such manufacture exists there now. The texture of muslin is usually plain, but sometimes the fabric is adorned with figured patterns, which are either executed in the process of weaving or afterwards put on by the hand. The manufacture of muslin was introduced into Europe from India about the end of the seventeenth century, and it is now largely carried on both in Great Britain (especially at and around Manchester, Glasgow, and Belfast) and in France. Europe now supplies the Indian market with all the common qualities of this fabric, but machine-made muslin has never been produced equal in delicacy and softness to the finest hand-woven Dacca muslins. The difference is solely in the weaving, for European manufacturers are now able to spin by machinery yarns of equal fineness with those used by the Indian weavers.

MUSPRATT, James Sheridan, a chemist, born at Dublin in 1821; died at West Derby, near Liverpool, in February, 1871. He studied chemistry under the celebrated Thomas Graham both at Glasgow and in London, and afterwards under Liebig at Giessen, in Germany, where he remained several years. While in Germany he was associated with Hofmann (another pupil of Liebig) in the discovery of toluidine and nitraniline. In 1850 he established a college of chemistry at Liverpool. In 1843 he published a translation of Plattner's Treatise on the Blowpipe. His chief work is a Dictionary of Chemistry, begun in 1854, but he is also the author of various contributions to scientific journals.

MUSSCHENBROEK, Pieter van, a celebrated natural philosopher, born at Leyden in 1692, studied in the university of that city, and entered upon the practice of medicine. Similarity of scientific tastes united him (1717) in a close intimacy with the celebrated S'Gravesande, with whom he pursued his studies in natural philosophy. After practising his profession four years Musschenbroek was appointed (1719) professor of philosophy and mathematics and extraordinary professor of medicine at Duisburg, and

soon acquired such a reputation that he was called (1723) to fill the philosophical and mathematical chair at Utrecht, and in 1739 or 1740 was invited to Leyden to occupy the place left vacant by the death of Wittichius. He died there in 1761. His principal works are Elementa Physica, Tentamina Experimentorum (1731), Institutiones Physicæ (1748), Compendium Physicæ Experimentalis (1762). Musschenbroek rendered important services to science. His experiments and his calculations prove his sagacity and accuracy. He invented the pyrometer, which has since been improved by Lambert and others.

MUSSEL. Under this term, popularly used, are comprehended several distinct kinds of Molluscs. The mussels are included in the Lamellibranchiate (which see) class of the Molluscan sub-kingdom, and are classified in the section Asiphonida of that class. This section includes those lamellibranchiates in which 'siphons,' or tubes admitting water to the gills, are absent. The halves or lobes of the mantle are not united, and the pallial line (see MOLLUSCA) is simple and unindented. The Common Mussel (*Mytilus edulis*) forms a typical example of the family Mytilidæ, the shells of which family are equivalve, and have a hinge destitute of teeth. The front muscular impression of the shell is of small size, that of the posterior adductor muscle being large. The foot is cylindrical in shape, and is grooved on its under surface. It secretes a 'byssus' or 'beard,' by means of which the mussels moor themselves firmly to fixed objects. The mantle-lobes are united between the siphonal apertures, or those by which water is admitted to or ejected from the gills. The common mussels are so familiar objects of our sea-coasts that no formal description of these animals is necessary. The mussel is extensively employed in Scotland as a bait for deep-sea fishermen; and in some districts it is used as an article of food, the best mussels approaching nearly to the more luxurious oyster in flavour. Cases of severe or even fatal illness have been reported as the effects of eating these molluscs; but such results are in all probability to be attributed to the fact of the mussels having been taken from a locality in which the flesh has become impregnated with putrefying or other noxious substances. The mussel is cultivated as an article of diet on the Continent. The 'mussel-farms' of the Bay of Aiguillon, near Rochelle in France, form the most notable examples of the prosecution of this branch of industry; and in the 'farms' these molluscs are tended and bred with due and persevering care. The annual revenue of the whole bay is stated to be about £480,000, the trade employing many hundreds of persons. The genus *Modiola*, or 'Horse Mussels,' is also included in the family Mytilidæ. The beak of the shell in these latter forms is blunted; the shell is oblong, and the hinge is edentulous.

The family Unionidæ includes the Fresh-water or River Mussels (*Unio*), and the Swan or Pond Mussels (*Anodon*). This family is distinguished by the generally equivalve dimensions of the shell, and by the large size of the external ligament. The front hinge-teeth are large, thick, and striated; the posterior teeth being laminar, or they may be absent altogether. The lobes of the mantle are united between the respiratory apertures. The foot is large and compressed in shape, and that of the embryo produces a 'byssus.' The Unionidæ inhabit fresh water exclusively. The Pond Mussels, of which many species (*A. cygnea*, *A. magnifica*, *A. ensiformis*, *A. anserina*, &c.) are known, are found in the rivers and lakes both of Europe and America. The hinges of the shell in the genus *Anodon* are destitute of teeth, and hence the derivation of the name. The shells are generally of rounded or oval shape, the shell substance being thin in texture. The *Unio pictorum* (Pl. CXXX.-CXXXI. fig. 16), so named from the shell being formerly much used for holding the colours of painters, is a familiar example of the genus of 'river-mussels,' which are found in most of the fresh-water rivers and streams of Europe and America. The hinge of the shell in the genus *Unio* is toothed. The *Unio littoralis* (Cuvier) is also a familiar species; and the *Unio margaratiferus*, or Pearl Mussel, has attained a reputation from the fact that of late years especially its pursuit for the sake of the contained pearls has yielded considerable profits in Great Britain. The fresh-water streams and rivers of Perthshire and of other Scotch counties have from this pursuit become almost entirely devastated of those mussels. Even in the last century Scotch pearls, furnished by the fresh-water mussels, were much valued; and pearls to the value of £10,000 were sent to London from the rivers Tay and Isla between the years 1761 and 1784. In 1864 the sum of £10,000 was said to represent the gains of the Scotch pearl-hunters for a single year. The rivers Don, Tay, Doon, Forth, Isla, and Spey are among those most noted for their pearl mussels; but since the date last mentioned the catch of these mussels has dwindled away to very insignificant proportions.

The genus *Mytilus*, in its fossil or palæontological history, begins in the Permian rocks. *Modiola* first occurs in the Liassic formations; *Unio* is first represented in the lower cretaceous rocks; whilst the Anodons are of much later occurrence, and commence in the Eocene or lower Tertiary formations.

MUSSELBURGH, a parl. burgh of Scotland in Midlothian, 6 m. east of Edinburgh, on the Firth of Forth, at the mouth of the Esk, which divides it into two parts, ancient Musselburgh and Fisherrow. It has a bridge, believed to be of Roman erection; and a curious old tolbooth (not now used as a jail), built in 1590, out of materials from the celebrated Chapel of Loretto. The chief manufactures are leather, paper, and fishing-nets by machinery. There is a fishing population of about 1100. The battle of Pinkie, in 1547, was fought in the vicinity. Together with Leith and Portobello, it sends a member to Parliament. Pop. in 1881, 7866.

MUSSET, LOUIS CHARLES ALFRED DE, a French poet, novelist, and dramatist, born at Paris in 1810; died there in 1857. After trying various professions and being dissatisfied with them all he, about 1830, gave himself up wholly to literature, and in that year published his Contes d'Espagne et d'Italie. In 1831 appeared a new collection entitled Poésies diverses, and in 1833 a third, bearing the general title Un Spectacle dans un fauteuil, in which the two chief pieces are a comedy of a light and delicate grace called A quoi rêvent les jeunes filles, and a poem entitled Namouna, written after the manner of Byron, and containing some admirable passages mingled with others which show signs of immaturity. In 1836 was published his Confession d'un enfant du siècle, a gloomy novel, containing the analysis of a diseased state of mind, all the phases of which the author had studied in himself, and which had already revealed itself in some of his earlier poems. The same settled melancholy also distinguishes his Rolla, Une bonne fortune, Lucie, Les Nuits, Une Lettre à Lamartine, Stances à Madame Malibran, L'espoir en Dieu, and other poems, written some before and some after the Confession d'un enfant du siècle, and many of them first published in the Revue de deux mondes. The prose tales which he contributed to the same periodical are full of grace and feeling, and often excite strong emotions by the simplest means. The same qualities are found in his comedies and *proverbes* (short drama-

tic pieces), published in 1840. One of these short pieces, called Un caprice, was performed at the Théâtre Français in 1847, and although not composed in accordance with the customs of the stage, succeeded by the truth of the characters and the charm of the dialogue. In 1848 Musset was deprived by the revolution of the situation of librarian to the ministry of the interior, a sinecure which he had obtained through the favour of the Duke of Orleans, but he was restored to this post under the empire, and was in addition appointed reader to the empress. In 1852 he was admitted a member of the French Academy. During the last years of his life he sank into a state of extreme lassitude of mind and body, which was only relieved by excitements of the coarsest description. During this period he was entirely unproductive.

MUST, the juice of the grape, which by fermentation is converted into wine. In the wine countries this unfermented sweet must is distinguished from the sour must or unripe wine of a year old. Fresh must contains a good deal of sugar and mucilage, which last disposes it to fermentation. It can be kept in close vessels after the mucilage has been precipitated.

MUSTARD (*Sinapis nigra*) is a native of Europe, and is very commonly cultivated for the sake of the seeds, which, when powdered and mixed with vinegar, form a well-known pungent condiment in daily use. The root is annual; the stem 3 or 4 feet high; the lower leaves are lyrate, and the upper ones lanceolate and entire; the flowers are small and yellow. It belongs to the natural family Cruciferæ, and is known by the smooth, four-cornered pods, which are pressed close to the stem. Table mustard, mixed with warm water, and taken in considerable quantities, acts as an emetic, and as such is so much the more valuable from its being always at hand. The white mustard (*S. alba*) is milder than the preceding, and on this account is more agreeable to some palates.

MUSTARD, Composition of. Besides 8 per cent. or so of moisture and 4 to 5 per cent of ash mustard contains small amounts of *myronic acid* $C_{10}H_{19}NS_2O_{10}$, which exists in combination with potassium, and of an albumenoid substance called *myrosin*, which acts under certain conditions as a ferment upon the myronic acid, giving rise to the formation of volatile mustard oil, a substance identical with *allyl sulphocyanate*, C_4H_5NS. Besides these substances mustard yields by pressure a quantity—varying from 18 to 36 per cent.—of a yellow, nearly inodorous oil, having a specific gravity of ·9145 at 15°. Commercial mustard is very generally adulterated with flour and turmeric; the former adds bulk to the mustard, while the latter gives a yellow colour to the mixture.

MUSTER, in a military sense, a review of troops under arms, to see if they be complete and in good order; to take an account of their numbers, the condition they are in, viewing their arms and accoutrements, &c.

MUSTER-ROLL, a list of the officers and men in every regiment, troop, or company, which is delivered to the inspecting field-officer, muster-master, regimental or district paymaster (as the case may be), whereby their condition is known.

MUSULMAN. See Moslem.

MUTINY in the British army is punishable under the Mutiny Act, which has been passed every year (except from 1698 to 1701) since 1689. By this act the crown is empowered to make articles of war, that is, rules or orders for the better government of the army. The Mutiny Act provides that no offence shall be made punishable with death except those which are specified therein. These are mutiny and sedition, not endeavouring to suppress the same, not giving information of the same to the commanding officer, misbehaviour before the enemy, shamefully abandoning or giving up a post, compelling the commanding officer so to do, leaving one's post before relieved, being found sleeping on one's post, holding correspondence with any rebel or enemy, entering into terms with the same without the license of his majesty or of the commanding officer, striking or using violence towards a superior officer being in the execution of his duty, disobeying any lawful command of a superior officer, and deserting while on active service. Volunteers are subject to the Mutiny Act, and the permanent staff of the volunteers are always subject to it. A Marine Mutiny Act, applying to marines while on shore, is likewise passed every year. Its provisions are similar to that passed for the army. The government of the royal navy is regulated by 29 and 30 Vict. cap. cix. (1866), which, instead of empowering the crown to fix the articles at pleasure, like the annual mutiny act for the army, contains an enumeration of nearly every possible offence, and annexes a certain punishment. Mutiny, when accompanied by acts of violence, is punishable with death. For the law relating to offences committed by seamen on board merchant vessels see Seamen.

MUTTRA, a town in India, in the North-west Provinces, on the Jamna, 36 miles north-west of Agra. It is an old Hindu city, and is identified by some with the Methora mentioned by Arrian. It is regarded as the birth-place of Krishna, on which account it was pillaged by Mahmud, the Ghaznavide conqueror, early in the eleventh century. Pop. in 1881, 60,000.

MUTUAL INSTRUCTION is the name given to that arrangement of schools by which the more able scholars in every class assist and superintend their fellow pupils. This name, which originated in France, is not appropriate, as mutual instruction does not, in fact, take place: but some of the most distinguished scholars occupy the place of the master, while the less able do not in turn instruct them. The origin of this system may be traced to India, where the traveller Della Valle found it established as early as the sixteenth century. The object of this system is to carry on schools chiefly by means of the scholars themselves, and to instruct an uncommon number of pupils at once (Lancaster had 880 together, and said that he could teach 1000), with comparatively few masters and little expense. The pupils are divided into small classes, each instructed by one of the more advanced scholars in reading, writing, arithmetic, and a few other elementary subjects. Such teachers are called *monitors*, whence the system is sometimes called the monitorial system. The oldest and most trustworthy pupils have the superintendence as general monitors. Other assistants take care of the lower departments of service, or the police of the school; one notes down the absent, one rules the writing-books, attends to the distribution of slates, &c. The strictest discipline and order being observed, the whole appears like a great piece of clock-work, which moves without the interference of one part with another. The school resembles an army, which a single man is enabled to command by means of order and discipline, and because every one knows precisely his duty. All are instructed, and teachers are formed at the same time. Cheapness is always kept in view. In England, where this system was first introduced from India, and is known under the name of the Madras system, in Scotland, and in Ireland, numerous children were educated according to this method, in the earlier years of the present century. The system was rapidly adopted and extended in various

European countries, and even in other parts of the world. But soon a reaction took place, especially in Germany. It was found that almost the only recommendation of the plan was its cheapness, and that to give satisfactory instruction even in elementary subjects an experienced teacher is indispensable. The system of monitorial instruction has accordingly in a great measure died out, except as a means of training those destined for the teaching profession.

MUTULE, an ornament in Doric architecture, corresponding to the modillion in the Corinthian and composite orders, and consisting of a projecting block in the cornice immediately under the corona, and perpendicularly above the triglyph. It is often made to slope downwards towards the front, and usually has guttæ or drops underneath.

MYCENÆ, an ancient city of Argolis, in the Peloponnesus, about 6 miles north-east of Argos. It is said to have been founded by Perseus, and before the commencement of the Trojan war was the residence of Agamemnon, in whose reign it was regarded as the leading city in Greece. It declined in importance after the invasion of the Dorians. Its ruins are extremely interesting from their antiquity and grandeur. Among them are the Lion's Gate, and the vaulted building of enormous stones called the *Treasury of Atreus*, &c. Dr. Schliemann has carried out excavations here with valuable and interesting results; see his Discoveries on the Site of Ancient Mycenæ.

MYCONI (anciently *Myconos*), an island in the Grecian Archipelago, in the eparchy of Syra, about 21 miles in circuit. It is little more than a barren rock. The inhabitants are for the most part employed in seafaring pursuits, being considered the best navigators in these seas. The chief town, Myconi, a seaport, contains about 5000 inhabitants. It produces little wheat, but plenty of barley, raisins, and figs, with some olives. Partridges, quails, turtle-doves, beccaficos, and rabbits are in the greatest plenty. Sheep and goats are reared, and good cheese is made. Pop. 6000.

MYELITIS (from the Greek *myelos*, narrow), in medicine, inflammation of the spinal marrow. Myelitis is produced by the same causes as any other inflammation. Its symptoms vary according to the part of the spine which is affected. If the inflammation is in the upper part, above the nerves which give movement to the respiratory muscles, there results such disorder in the functions necessary to respiration as speedily proves fatal. If the inflammation exists lower down, the mechanical phenomena of breathing are not interfered with, at least at first; but there is more or less disturbance in the powers of motion or the sensibility of the parts to which the inflamed portion of the spinal marrow distributes its nerves. Hence arise convulsions and tetanic spasms, or paralysis of greater or less extent.

MYLITTA, an Assyrian goddess, identified by the Greeks with Aphroditē. She was, as goddess of the moon, the female principle of generation. Among the licentious Babylonians it was the custom for every woman to prostitute herself once to a stranger for a certain sum of money in the temple of Mylitta. The money was deposited by the woman in the treasury of the temple. Herodotus relates that the women, with wreaths on their heads, seated themselves in the porticoes of the temple, through which the strangers passed to make their selection. They dared not return home till some stranger had thrown into their lap the money, with these words, 'I invoke for you the goddess Mylitta.'

MYLODON (Greek, *mulos* or *mulē*, a mill; *odous*, tooth), a genus of extinct Edentate Mammalia, of sloth-like structure and large proportions, the remains of which occur along with those of the Megatherium and Megalonyx (which see), in the recent or post-tertiary deposits of South America. In size the *Mylodon robustus*—the most familiar species—attained a length, in some instances, of 11 feet. The structure of the Mylodon agrees in most respects with that of its companion the Megatherium. The Mylodon was a sloth of terrestrial habits, and obtained the vegetable food upon which it subsisted chiefly by uprooting trees—a feat for which its enormous strength would amply fit it. The dental arrangement is the same as that of the Megatherium. There are five upper and four lower molar or grinding teeth, with flattened crowns. The fore-feet were provided with five, and the hinder with four toes. The two outer toes were destitute of nails. The skeleton of the Mylodon was first discovered in the year 1841, at a depth of 12 feet, in the fluviatile or superficial deposits of South America, about 7 leagues to the north of Buenos Ayres.

MYOLOGY (Greek, *mus*, muscle, and *logos*, science), the term applied distinctively in anatomical and physiological science to the description of the muscular system, both in its structural and functional aspects. In anatomy the term 'myology' is occasionally used to signify the mere description of the structure and relations of the muscles of the body. But in modern science the use of this and other specific terms has greatly decreased. See MUSCLE.

MYOPIA. See SHORT-SIGHTEDNESS.

MYRIAD, ten thousand; in poetical language it generally implies an innumerable multitude.

MYRIAPODA, the lowest class of the Higher Annulose or Arthropodous animals, represented by the Centipedes, Millepedes, and their allies (Pl. LXIX.–LXX.). Leach was the first to define this group, which was included by Linnæus among the Apterous or Wingless insects. Lamarck placed them amongst his Arachnides; whilst by other observers they were included with the insect class, after the example of Linnæus. Their perfectly distinct position in modern zoology admits of no doubt. In general organization they resemble, but are of a lower structural type than the insects. They are defined as Arthropodous Annuloss—that is, Annulose animals having jointed limbs articulated to the body—possessing a distinct head, but with the segments of the thorax and abdomen essentially similar in appearance; a structure rendering the separation of the chest from the abdomen a matter of difficulty. One pair of antennæ or feelers exists. The breathing is carried on by means of tracheæ or air-tubes, as in insects, and the number of legs always exceeds eight pairs. No wings are developed. The familiar Centipedes afford typical examples of the class, in which the chief structural features of the Myriapoda may be conveniently studied. The integument is of horny or chitinous nature. There are—save in a single example, the little *Pauropus* of Sir John Lubbock—always more than twenty somites or joints in the body. Pauropus possesses a body composed of only ten joints. The head consists of five or six coalescent segments; the appendages of the head and front segments being generally modified for prehensile purposes. Each segment of the body, save the head and terminal joint, bears a pair of jointed limbs. In some cases two pairs of limbs are apparently borne by each segment, but this condition is produced by the union of *two* segments to form a single compound joint. The head bears the two antennæ, and simple eyes or ocelli, which are always sessile. In *Scutigera* the eyes are of facetted or compound nature. In *Pauropus* the feelers are bifid, and bear jointed appendages, this structure being peculiar to this single form. The mouth is provided with mandibles or larger jaws, and maxillæ or lesser jaws; whilst in

some Myriapods the feet in the neighbourhood of the head are modified to form *maxillipedes* or 'foot-jaws.' The digestive system is modelled after a very perfect type, and exhibits an adaptation for carnivorous food in the Centipedes; whilst in the Millepedes the diet is of a vegetable nature, and the digestive tract is modified accordingly. Salivary glands are developed; the liver being represented by hepatic tubes or *cæca*. The blood is corpusculated, and the heart exists as a chambered tube, lying, as in all Annulosa, on the back or dorsal aspect of the body. The blood is propelled forwards towards the head, regurgitation being prevented by the valves which separate the different chambers of the heart. The breathing system consists of air-tubes or tracheæ, which open externally on the sides of the body by definite apertures known as 'spiracles' or 'stigmata.' These air-tubes ramify throughout the body, their ultimate branches permeating the minutest tissues. The nervous system exists as a gangliated chain, disposed along the ventral aspect or floor of the body. There is a large supra-œsophageal nervous mass, an œsophageal 'collar,' and special ganglia supplying nerve filaments to the viscera. The reproductive organs of the male Centipedes exist as testes of fusiform shape, which open by an excretory duct near the anus. Those of the female are represented by a simple tube destitute of appendages. In the Millepedes the generative organs of both sexes are of a simpler type of structure, and consist of a pair of simple tubes, to which a series of blind sacs are attached, and which open by a duct leading to the seventh segment of the body. In their development the Myriapoda undergo no metamorphosis such as that exhibited by insects, but the young form undergoes frequent moultings or changes of skin; the number of segments and limbs increasing after each successive moult. In some Myriapoda the full or adult stage of growth is not attained until after a period of two years, which period is occupied in successive processes of 'ecdysis' or moulting.

Classification.—The class Myriapoda is divisible into three orders, the last of which, *Pauropoda*, has been recently added for the reception of the anomalous form *Pauropus* already referred to. The first order, represented by the Centipedes (*Scolopendridæ*) is that of the *Chilopoda* ('lip-footed'). The number of legs in this division is rarely excessive, and does not generally exceed twenty pairs. The antennæ consist of from fourteen to forty joints. The masticatory apparatus consists, firstly, of two mandibles, furnished with palpi or organs of touch. A lower lip or labium is also present; and in addition two pairs of maxillipedes or foot-jaws are developed. The hinder pair of foot-jaws is provided with hooks or fangs, which communicate internally with a poison-gland. Each segment bears a single pair of legs only. The body is generally flattened from above downwards. The reproductive organs open at the posterior extremity of the body. The various species of Centipedes (*Scolopendra*) typically represent this section; some of these forms, especially those from tropical regions, attaining a comparatively large size. These animals form the type of the family Scolopendridæ. Their bite does not necessarily produce fatal effects, but they are generally avoided as unpleasant, if not actually dangerous neighbours. The British representatives of the group comprise the familiar *Lithobius forcipatus*, and other species of that genus. And the *Geophilidæ*, including several species, of which the *Geophilus electricus* and the *G. longicornis* are familiar examples, are also common in Britain. The *Scutigeridæ* form the type of another division of this order. The third family, that of the *Cermatiidæ*, possess shorter bodies than the preceding forms, and are chiefly found in warm and tropical countries. The second order, known as the *Chilognatha* ('lip-jawed'), includes the Millipedes and Gally-worms (*Julidæ*), familiarly known as 'hairy-worms'—the so-called 'hairs' being in reality the infinitesimally small, numerous, and closely-packed feet. In this order the coalescent segments bear each two pairs of legs; the antennæ are composed of six or seven joints; the mouth-organs consist of two palpless mandibles and of a 'labium' or lower-lip, formed of a united pair of maxillæ or lesser jaws. The reproductive apertures are situated in the front segments of the body. These forms feed on decaying vegetable matter, and are found in damp situations, such as under moss and stones, in the bark of trees, and similar places. They possess the power of rolling themselves up into a ball when touched or irritated. Of the families into which the order Chilognatha is divided the first is the *Polyxenidæ*, represented by the *Polyxenus lagurus*, which infests the bark of trees, and averages $\frac{1}{6}$ of an inch in length. The *Polydesmidæ*, with both British and foreign representatives, possess flattened bodies. A familiar species is the *Polydesmus complanatus*. The *Glomeridæ* have a short body, of oval shape, convex above and concave below, and which is covered by small lateral scales. The *Glomeris marginata* represents this section. The *Julidæ*, forming the typical group of the order, comprise many species of Millepedes. The body is cylindrical in shape. These animals inhabit mossy places, and move slowly along by means of their numerous feet.

The order *Pauropoda*, represented by the little *Pauropus*, are distinguished by the diminutive body ($\frac{1}{25}$th of an inch in length), consisting of only ten segments, which are furnished with bristles or *setæ*. Nine pairs of legs exist. The head consists of two coalescent somites. The antennæ are composed of five joints, are bifid, and possess jointed appendages. The colour is white; and no specialized breathing-organs are developed, the function of respiration devolving on the skin or general body-surface. The genus includes several species, both British and American. These animals, like the members of the preceding order, appear to inhabit damp places. Foot-jaws are totally wanting in the Pauropoda, which thus, in the small number of body-segments and legs; in the minute size of body; in the antennæ being bifid, branched, and composed of only five joints; and in the absence of defined air-tubes or respiratory-organs, present characters of anomalous and interesting kind.

The Myriapoda are geologically represented for the first time in the Carboniferous formations; the Xylobius and Archiulus of the coal epoch belonging to the order Chilognatha. *Xylobius sigillariæ* is thus found in the hollow stems of the Sigillariæ—or certain characteristic plants of the coal period—which these forms must have inhabited, after the fashion and habits of their existing representatives. The Myriapods are also represented by the fossil genus *Euphoberia*, from the Carboniferous systems of North America and Britain. And from the Middle Oolitic formation a fossil *Geophilus* (*G. proavus*) has been described by Count Munster. In the amber deposits of the tertiary age, other species of these forms have been found in companionship with representatives of the insect and spider classes.

MYRMIDONS, a people on the southern borders of Thessaly, who accompanied Achilles to the Trojan war. They were said to have received their name from Myrmidon, a son of Zeus and Eurymedusa, or according to other accounts, from the fact of their being descended from the ants (*myrmēkes*), who were converted into men on the Island of Ægina in the reign of Æacus. They are said to have emigrated

into Thessaly under the leadership of Peleus. The term has received the signification of a bully, ruffian, or satellite of tyranny.

MYRONIC ACID. In the seed of black mustard there occurs a salt of potassium which, when suitably treated, yields an uncrystallizable syrup, having a bitter taste, and very acid, to which the above name is given. To this substance, from which a series of salts are formed, the formula $C_{10}H_{19}NS_2O_{10}$ is given.

MYRRH is the name given to a gum resin which exudes from a shrub growing in Arabia and Abyssinia, called *Balsamodendron Myrrha*. Myrrh contains more than one resin, besides essential oil, gum, and various salts, such as potassium sulphate, benzoate, malate, &c. By distillation with water myrrh yields a viscid, brownish-green, volatile oil.

MYRTLE, a genus of plants (natural order Myrtaceæ) consisting of aromatic trees or shrubs, with simple opposite leaves, which are sprinkled with pellucid glandular points, and having axillary or terminal white or rose-coloured flowers. One species, the Common Myrtle, is a native of the south of Europe and other countries bordering on the Mediterranean. It has been celebrated from remote antiquity on account of its fragrance and the beauty of its evergreen foliage, and by different nations was consecrated to various religious purposes. Myrtle wreaths adorned the brows of bloodless victors, and were the symbol of authority for magistrates at Athens. With the moderns it has always been a favourite ornamental plant. In the British Islands the myrtle flourishes in the open air only in the southern counties of England and Ireland. Farther north it must be treated as an exotic.

MYRTLE WAX. See CANDLEBERRY and WAX.

MYSIA, in ancient times the name applied to a district of Asia Minor, which varied greatly in extent at different periods. The name first occurs in the legend of Telephus, who became King of Mysia, by which was meant what was afterwards known as Teuthrania, forming only the south-western angle of what was called Mysia at a subsequent period. Under the Persian Empire Mysia was the name of the section between Lydia on the south and the range of Ida on the north. It was united with the region on the north and with Lydia in forming a single satrapy. After the overthrow of the Persian Empire by Alexander the Great, and the division of Alexander's dominions after his death, Mysia fell to Lysimachus (B.C. 311). Subsequently it formed part of the Græco-Syrian Kingdom, then of the Kingdom of Pergamus, and finally, in 133 B.C., was bequeathed with the rest of the Kingdom of Pergamus, by Attalus III. to the Romans, by whom it was made a part of the province of Mysia. When the divisions of Asia Minor were settled under Augustus, the name of Mysia was given to the whole of the north-western district, bounded on the north by the Propontis (Sea of Marmora), east by Bithynia and Phrygia, south by Lydia, and west by the Ægean Sea. It was subdivided into five smaller districts: 1. Mysia Minor, extending along the north coast. 2. Mysia Major, the south-eastern inland region, with a small part of the coast. 3. Troas, the north-western corner. 4. Æolis or Æolia, the southern part of the western coast, where were the chief cities of the Æolic Confederacy. And 5. Teuthrania, already mentioned. Under the later empire Mysia was erected into a separate proconsular province, and received the name of Hellespontus.

MYSOLE, an island in the Indian Archipelago, between Ceram and the north-west extremity of Papua. It is about 50 miles long by 15 miles broad, and is inhabited by immigrant Mohammedans on the coast, and aborigines (Malays and Papuans) in the interior. Trepang, missoy bark, ambergris, pearls, and pearl-oyster shells are exported in return for coarse piece-goods, cutlery, beads, iron, china, looking-glasses, and brass wire. At certain seasons large flocks of birds of paradise visit the island, and being caught with bird-lime and preserved with the feathers on, form also articles of export.

MYSOR, or MYSORE, a principality of Southern India, chiefly between lat. 11° and 15° N., surrounded by the British territories; area, 24,723 square miles. It is inclosed east and west by the Eastern and Western Ghauts, and on the south by the Nilgiri Mountains, and consists of high table-land, elevated about 2000 feet above the level of the sea. Its surface is curiously dotted with isolated bare masses of granite, locally called *drugs*. The climate, on account of the elevation of the country, is temperate. The only river of importance is the Kaveri. There are no lakes in the northern parts of Mysor, but many large tanks and artificial reservoirs, used for irrigation, in the high grounds. From these tanks a considerable part of the revenue of the principality is derived. The soil, consisting of a thick layer of vegetable mould, produces all the grains and vegetables of the other parts of India and many of the fruits of Europe. Coffee and silk are largely produced. There is a valuable belt of forests, in which excellent sandal-wood is grown, in the eastern part of Mysor. Of these forests 398 square miles are reserved. There is no regular system of registering the trade of Mysor; but in a recent year the value of exports was estimated at £1,100,000, and that of imports at £1,070,000. The exports consist chiefly of betel-nuts, coffee, cotton, cardamoms, rice, silk, and sugar; and the imports are mainly iron, gold, pepper, salt, and pulses. Silk and cotton manufactures are carried on to a considerable extent; cutlery, copper vessels, and gold and silver lace are among the other manufactures. Education in Mysor is making satisfactory progress. In the year 1880–81 the number of pupils attending the government and other schools and colleges was 42,657, or about 10 for every 1000 of the population. There is a branch examination in connection with the Madras University, held annually at Bangalor in December. There are also a central college and a special school of engineering and natural science. The revenue and expenditure of the principality are somewhat over £1,000,000. Mysor is administratively divided into the three commissionerships of Nandidroog, Ashtagram, and Nagar.

The first rajah of Mysor mentioned in history is Cham Raj, who began to reign in 1507. But the territories of Mysor received their most important accessions in the middle of the eighteenth century from the victories of Hyder Ali, who, without assuming the title, exercised all the power of sovereignty. His son Tippoo Saib perished in defending his capital in 1799, after an unsuccessful struggle with the British, who divided his dominions, and made a descendant of the ancient rajahs ruler over the portion of Tippoo's dominions to which the name of Mysor was restricted. The remainder was allotted partly to the Peishwa, partly to the Nizam, and partly to the East India Company; and when at a later period the Peishwa withdrew from the treaty, the part that had fallen to him was divided between the other two parties to the treaty. In 1834 the rajah whom the British had set up in Mysor was deposed on account of his misrule, and his territory taken under British administration, in which position it remained till March 1881, when it was handed over to a native maharajah educated under the care of the British. Pop. in 1881, 4,186,188.

MYSOR, a town in the south of Hindustan, capital of the state of same name, 250 miles west by south of Madras. It stands at an elevation of 2450 feet above the level of the sea. The streets are regular, and the houses intermingled with trees and temples. The fort, which is separated from the town by an esplanade, is built in imitation of the European style. It contains the rajah's palace and the dwellings of the principal merchants and bankers, and many other private edifices. To the south of the fort, and about 5 miles from the city, is Mysor Hill, on the summit of which is the British residency. Pop. 57,000.

MYSTAGOGUE, in the mysteries of antiquity, he who introduced the person to be initiated, also he who showed the interior of the temple. Hence *mystagogue* has been used in modern times for a person who pretends to deal in mysteries.

MYSTERIES were, among the Greeks, and afterwards also among the Romans, secret religious assemblies which no uninitiated person was permitted to approach. They originated at a very early period. They seem to have had a double object—first, that of handing down the traditions relating to the divinities in whose honour they were celebrated; and secondly, that of teaching and practising religious rites. At the festivals of the initiated the contents of those legends were usually represented in a dramatic form under the direction of the priests of the mysteries. Of religious instruction in our sense of the phrase, that is, the communication of higher ideas with regard to the divine person, and the philosophical interpretation of the myths of the popular superstition, there appears to have been in these ancient mysteries no trace. We may perhaps make one exception to this statement, inasmuch as it seems to be established that the Orphic mysteries taught in the clearest manner the immortality of the soul. The most important Greek mysteries were—1, the Eleusinian (described in the article ELEUSIS); 2, the Samothracian, which were celebrated in honour of the Cabiri in all the places where these divinities were worshipped, especially in Samothrace, Imbros, Lemnos, Thebes, Pergamus. Sometimes they were regarded as in honour of other divinities, such as Demeter, Persephonē, and Rhea, who were by some writers identified with the Cabiri. (For further information respecting the Samothracian mysteries see CABIRI.) 3. The Dionysia, which were celebrated in honour of Bacchus or Dionysus. These mysteries were of so licentious a character that they were forbidden in Thebes, even in the time of Epaminondas, and afterwards in all Greece, as prejudicial to the public peace and morals. This was likewise done in Italy by a decree of the Roman senate in 166 B.C. (See BACCHUS.) 4. The Orphic, already mentioned, founded by some who called themselves the followers of Orpheus about the time when Greek philosophy took its rise, and consecrated to Dionysus Zagreus, the son of Zeus and Persephonē. (See ORPHEUS.) The mysteries of Isis were not in vogue in Greece, but were very popular in Italy, particularly in Rome.

MYSTERIES, or more properly MIRACLES, a kind of rude drama, which was a favourite spectacle in the middle ages, represented at solemn festivals. The subjects were of a religious character, and the ecclesiastics were at first the performers and authors. The earliest play that is known to have been written on a biblical subject is one on Moses, the work of a Jew named Ezekiel, composed in the second century. Such plays in the middle ages were called *mysteries* and *miracles*, because they taught the mysterious doctrines of Christianity, and represented the miracles of the first founders of the faith, of the saints and martyrs. The first play of this sort specified by name appears to have been St. Catharine, written, according to Matthew Paris, by Geoffrey, a Norman, about 1110. They are not known to have been committed to writing till about the fifteenth century. They sometimes lasted several days. Thus we hear of one which lasted eight days, and contained the greater part of the Scripture history. The Corpus Christi, the famous Coventry mystery, begins with the creation and ends with the judgment-day. The Passion of Christ, the Slaughter of the Innocents (in Hawkins' Origin of the English Drama), &c., are among the subjects represented, the first perhaps more frequently than any other. Miracle plays are still performed at various places in Roman Catholic countries. A passion play, performed at the village of Ober-Ammergau, in Bavaria, every ten years, attracts much attention. The Mysteries were superseded by the Moralities (which see).

MYSTICISM denotes, in ecclesiastical language, the knowledge of God and intercourse with God from internal light, and the operation of grace, in opposition to revealed faith on the one hand, and speculative rational knowledge on the other. The modern use of the word has derived its origin from this ecclesiastical use, but in consequence of the numerous impure elements which have been associated with it, it has so changed its meaning that we no longer understand by it a religious devoting of the heart and will to the divine direction, but only the spiritual errors into which the mind may fall under such circumstances. Mysticism is hence, in the modern sense of the term, a morbid love of the mysterious, and the inclination thence arising to indulge in dark and bewildering fancies—a state produced when the mind, instead of resting in a truly religious manner in the mystery of its existence, indulges in vain and aimless desires to see that which cannot possibly be seen, to comprehend that which is incomprehensible, or by some special and extraordinary means to hold intercourse with the inhabitants of higher worlds. The distinction between mysticism and theological speculation consists in this, that the latter, under the guidance of reason and experience, ventures into the territory of the uncertain and mysterious only so far as reason and experience seem to lead the way, whereas the latter, turning a deaf ear to these guides, begins to do her own business, which consists in dreaming with waking thoughts, in peopling empty space with the creations of fancy, and in mixing up imaginary with actual existence. To these, should hallucinations be added, mysticism easily degenerates into complete insanity. The philosophy of antiquity did not steer clear of mysticism. At first it adopted mystical fancies only by way of accommodation, as was the case with Pythagoras and Heraclitus, but on the introduction of the New Platonism it applied the impress of the mysteries to the Platonic philosophy, adapted to it the forms of devotion learned in the mysteries, and became, as appears in Iamblichus and the writings attributed to Hermes Trismegistus, altogether visionary and fantastical. Christianity, in consequence of its special tendency to practical good, as well as of its submission to a system of doctrine expressly revealed, afforded less scope for the extravagances of mysticism. It soon, however, made its appearance, forming a kind of profane mixture, and reached its extreme in the writings of the so-called Dionysius the Areopagite, in which Christianity is presented under the form of New Platonic Mysteriosophy. This pseudo-Dionysius obtained an extensive influence, especially through Hugo St. Victor, in the twelfth century, and was everywhere held in high respect until the time of the Reformation. In opposition to scholasticism, which laboured in the construction of a systematical and almost demonstra-

tive theology, this system embodied a theology of devotion, of feeling, and immediate illumination, which attached very little importance to intellectual effort, and laid so much the more weight on purification of heart and ascetic morality. Of this class were Hermann von Fritzlar, Eckardt, Tauler, and Thomas à Kempis. Inasmuch as their opposition to scholasticism included in it an indirect protestation against the corruptions prevalent among the clergy they have been regarded as forerunners of the Reformation. In the philosophy of the fifteenth and sixteenth centuries, in Paracelsus, Bruno, Campanella, and others, mysticism presented itself in extravagant flights of fancy, in speculations concerning nature and the general constitution of being, and took a direction, which at a later period gave rise, on the side of philosophy, to the alchemists and Rosicrucians, and on the side of theology to a number of religious sects, of which such men as Jacob Böhmen and Swedenborg may be considered the representatives. The Quietism of Madame Guyon and her adherents (such as Fénelon) in France in the eighteenth century was a product of the same nature. Very different opinions may be entertained as to the intrinsic value of the writings of the Mystics, but they are undoubtedly of importance in the history of the human mind, as exhibiting one of its most remarkable phases under particular circumstances of development. Islamism, though at the outset it was little favourable to mysticism in consequence of its warlike tendencies, at a later period took a mystical form under the name of Sufism, and even carried it to a very extravagant height. See Tholuck, Blütensammlung aus der Morgenländischen Mystik (Berlin, 1825).

MYTHOLOGY (Greek, from *muthos* or *mythus*, a tale or fable, and *logos*, a discourse), the collective name for the whole body of fables, legends, or traditions (myths) that take their rise at an early period of a nation's existence and of its civilization, and which embody the convictions of the people among whom such fables arise as to their gods or other divine personages, their origin and early history, and the heroes connected with it, the origin of the world, &c. Such fabulous narratives seem to grow up naturally among all early peoples, and are found among the ruder races at the present day, but the mythologies which have been most studied, and the tales belonging to which are best known, are those of ancient Greece and Rome, Scandinavia, the Hindus, and ancient Egypt. Though speculations as to the origin of mythology have been put forth from a very early period, it is only in recent times, by the help of comparative philology, and by comparing together the myths of different peoples (comparative mythology), that any real advance has been made, and the study of mythology placed upon a scientific basis. The mythologies of Greece and India have been most fruitful for this purpose, and that of Greece in particular must always be largely drawn upon in any exposition of the results arrived at by modern investigators.

Myths are of course believed in by the bulk of the people among whom they are current, and it is only when speculative and reflective spirits arise, and when science and philosophy have made some advances, that their truth is called in question. Thus Zeus, Apollo, Athēnē, Heracles, and the other divinities of ancient Greece, were believed by the bulk of the people to have a real existence, and the stories regarding them were looked upon as true; but even in Greece in early times the absurdities and monstrosities of some of the myths attracted the attention of philosophers, and led to attempts at explaining the stories in such a way as that they should not shock common sense or moral feeling. By some authors the stories that represent the gods as guilty of gross immorality, as impure, cruel, and deceitful, were flatly denied, and those authors in whose writings such stories are found were accused of having invented them themselves. Homer and Hesiod were severely censured by Xenophanes and Heraclitus on this account; and Plato would not endure the idea that the Homeric poems should be admitted into his ideal republic. Others did not take the rough-and-ready method of simply denying the truth of the obnoxious stories, but attempted to explain their origin. In doing so they followed three chief systems of interpretation, called respectively by Max Müller the *ethical*, the *physical*, and the *historical*. Those who adopted the first explained that the stories of the power and omniscience of the gods, of their rewarding good and punishing evil, were invented by wise men for the purpose of maintaining law and order in communities—leaving it to be supposed that the immoral representations of the gods were the inventions of foolish poets. Though this theory was supported by no evidence it obtained a pretty wide currency. The interpreters of the physical (also called the allegorical) school held that the myths contained explanations of natural phenomena, or of certain views regarding natural phenomena, under a peculiar phraseology, which disclosed its hidden wisdom when rightly understood. For instance, Zeus, Hera, Aidoneus, and Nestis were explained by some as standing for fire, air, earth, and water; and others, up to our own time, have endeavoured to find astronomy, or some of the other physical sciences, hidden under the mythology of Greece. Creuzer may be classed as belonging to this school, his work on the Mythology of the Ancients (Symbolik und Mythologie der alten Völker, 1819–21) being written to prove 'that Greek mythology was composed by priests, born or instructed in the East, who wished to raise the semi-barbarous races of Greece to a higher civilization and a purer knowledge of the Deity. There was, according to Creuzer and his school, a deep mysterious wisdom and a monotheistic religion veiled under the symbolical language of mythology, which language, though unintelligible to the people, was understood by the priests, and may be interpreted even now by the thoughtful student of mythology' (Max Müller). The third or historical school, identified with the name of Euhemerus, represented the gods as having been originally kings or chiefs, great warriors, sages, or benefactors of the human race, who, being exalted above their fellow-men in life, after their death gradually came to be looked upon as deities. By disciples of this school, Jupiter, for instance, is said to have been an ancient ruler of Crete, Æolus (the god of the winds), a skilful mariner; Atlas, a great astronomer, and so on. The Euhemeristic school is not even yet extinct, and at the present day it includes some who find in the sacred Scriptures prototypes of mythological personages.

The most recent theory of mythology, that which has been already mentioned as based upon comparative philology, and on a comparison of the myths of the different Indo-European nations, if it has not been generally accepted to the full extent to which some of its advocates would carry it, has at any rate established a good many of its conclusions on a firm basis. Its chief exponents and supporters in Britain, those by whom, indeed, it has been mainly worked out, are Max Müller and the Rev. Sir G. W. Cox. This system of mythical interpretation may also be called physical, inasmuch as it maintains that all myths have their origin in physical phenomena; but it differs from the older physical or allegorical school in explaining myths as an unconscious product

of the popular mind, whereas an allegory (such as the older physical school represented myths to be) is a conscious product of some individual mind. The exponents of this school tell us that in order to understand how myths grow up naturally we must carry our thoughts backwards to an early stage of language and civilization, when men have little or no real knowledge of the external world, when they use themselves as the gauge of all phenomena, and endow every object of sense with a conscious life similar to their own, applying to inanimate objects the language which they use when speaking of their own feelings or actions. In early times men would speak quite naturally of the sun as the child of the night, as the destroyer of the darkness, as the lover of the dawn, and as deserting her, as the lover of the dew and also as killing (drying up) the dew, as the benefactor of man, as travelling over many lands, as the child of the morning, as her husband, as her destroyer, and so on. This language, which we should call poetical, was the natural language of early times, and was perfectly understood as descriptive simply of natural phenomena, and nothing else. In course of time, however, men came to take a more prosaic view of nature, so to speak, and while one or two epithets would be retained as simply naming the sun, for instance, a multitude of phrases once applied to him would lose their special meaning as descriptive of solar phenomena, and after lingering for a time with a half-physical, half-mythical application—as we find in the hymns of the Rig Veda—would end by becoming the germs of myths pregnant with human feeling. In this way it is explained that Phœbus Apollo, Endymion, Phaethon, and Heracles are all personifications of the sun, and all or most of the legends which constitute their mythological history are essentially pictures of natural phenomena, in which the sun plays an important part; but these names were originally significant epithets applied to the sun from his brilliancy or other characteristic, and it was only in later times, when their true meaning was forgotten, as well as that of the phrases of which they formed part, that they became the names of divinities, who were regarded as quite distinct from each other. So Zeus originally meant the sky, Athēnē and Daphnē the dawn, Hermes the wind, and so on. Prof. Müller and Sir G. W. Cox trace the vast majority of myths to phenomena in which the sun plays a principal part. To quote the words of the former:—'I look upon the sunrise and sunset, on the daily return of day and night, on the battle between light and darkness, on the whole solar drama in all its details that is acted every day, every month, every year, in heaven and in earth, as the principal subject of early mythology. I consider that the very idea of divine powers sprang from the wonderment with which the forefathers of the Aryan family stared at the bright powers that came and went, no one knew whence or whither; that never failed, never faded, never died, and were called immortal, that is, unfading, as compared with the feeble and decaying race of man. I consider the regular recurrence of phenomena an almost indispensable condition of their being raised, through the charms of mythological phraseology, to the rank of immortals, and I give a proportionately small space to meteorological phenomena, such as clouds, thunder, and lightning, which although causing for a time a violent commotion in nature and in the heart of man, would not be ranked together with the immortal bright beings, but would rather be classed either as their subjects or as their enemies.' Others, including some of the most eminent mythologists of Germany, assign the sun a subordinate position in mythology, and attribute the origin of the majority of myths to phraseology referring to clouds, storms, rains, winds, lightning, and thunder, maintaining that 'originally the sun was conceived implicitly as a mere accident in the heavenly scenery, and assumed importance only in a more advanced state in the contemplation of nature and the formation of myths.'

We shall now give a few examples to show how the theory is applied in the explanation of myths. The well known story of Apollo slaying the children of Niobē with his arrows is nothing more than a mythological way of telling how the morning clouds are dispersed before the rays of the rising sun: and the story of Apollo and Daphnē is the story of the love of the Sun for the Dawn, who flies at his approach, and dies away as he is about to touch her. Heracles, again, is the sun labouring throughout his life for the benefit of others: soon after birth he strangles the serpents of darkness, and after performing innumerable toils in many lands, he dies on the funeral pyre, as the sun sinks in the fiery west. Perseus also is the sun, and the Gorgon Medusa whom he slays is the night, which disappears at sunrise. Like other solar heroes, such as Phœbus, Theseus, Philoctetes, Achilles, Bellerophon, and Sigurd in northern mythology, he receives invincible weapons, which enable him safely to carry out all his exploits. The sun which scatters the darkness may also be called the child of the darkness, and so as Perseus unintentionally kills his father Acrisius, Œdipus, another solar hero, kills his father Laius, and Theseus causes the death of his father Ægeus. Endymion, as his name implies, is the setting sun, who is courted by the moon, and who sinks to sleep in the west. The story of Phaethon recalls the language that men made use of when they saw the herbage burned up by the fiery rays of the sun in a season of drought. 'Some one,' they said, 'is driving the chariot of the sun who cannot guide the horses.' Even the tale of the Trojan war is traced to a solar origin, and is made out to be but 'a repetition of the daily siege of the east by the solar powers that every evening are robbed of their brightest treasures in the west' (Max Müller). The Dawn, or evening twilight (Helen) is stolen from the west by the dark powers of night (Paris and his friends), and the children of the sun (Agamemnon and his friends) go to fetch her back. For ten years (ten hours of darkness) they assail the citadel of the robbers, and only after a weary course of fighting do they succeed in capturing it (when the sun bursts forth in the morning). So also the story of Ulysses and his return from the Trojan war 'had its origin in phrases which described the general phenomena of daytime from the rising of the sun to its setting. The sun leaves his bride, the twilight, in the sky when he sinks beneath the sea to journey in silence and darkness to the scene of the great fight with the powers of darkness. The ten weary years of the war are the weary hours of the night; in the tenth the fortress falls, as the dark shades are scattered at break of day. The victory is won; but the sun still longs to see the fair and beautiful bride from whom he was parted yester eve' (Cox); and so he begins his long and toilsome journey, which occupies another ten years. In his westward course he encounters, among other adventures, the one-eyed monster Polyphemus, a personification of the 'shapeless vapours which rise from the waters, and through which the sun, like a huge eye, sheds a sickly light;' his followers kill the cattle of the sun, 350 in number, that is, they waste the passing days, and so they can never reach their homes; he is cajoled by the goddess Calypso (Greek *kaluptō*, to conceal) to stay with her in her island cave, and forgets for a time his journey, that is to say, the sun is hidden by the night, and is only

relieved from its dominion by the approach of morning (Hermes or Mercury in the myth); and so the whole journey of Ulysses is explained by a reference to solar phenomena. But, as already intimated, though the sun plays a most important part in Greek mythology, some of the most important mythological personages are derived from other natural objects. Zeus, for instance, the supreme god, the same as the Jupiter of the Romans and the Dyaus of the early Hindus, is not the sun, but the bright sky, and thus it is Zeus who is the cloud-gatherer, the god of the dark clouds, the thunderer, the sender of rain, the giver of bounteous harvests, the eternal and unchangeable, like the sky. Hermes again is the wind, and the cattle of Phœbus that he thievishly drives away are the bright clouds driven through the air by the breeze, 'his twistings and turnings, his shifty evasions, his downright lies, his gentleness and his rage, the gigantic strength which he can put forth at will, the sweet repose to which he can return at pleasure, all stand out with life-like fidelity as characteristics of the wind.' Demeter, who loses her child Persephonē, is the earth, who for six months every year has to mourn the loss of the summer. And turning to the mythologies of other Indo-European nations, we find among the Hindus the sky-god Dyaus (from *dyu*, to shine), whose name, however, always retained its meaning of sky, so that Dyaus had only an indistinct personality as a deity. Dyaus, as already mentioned, is the same as Zeus, and also the same as the *Ju* of the Roman Jupiter, the latter part of this name signifying simply father. *Deus*, god, is also from the same root; as is also the name of the god Tyr, of northern mythology, the god of war and athletic sports. The Hindu Varuna, a sky god, is clearly the same as the Greek Ouranos, which word, besides being the name of a deity, had the ordinary signification of sky or heaven. The Vedic god Indra again, whose name is derived from *indu*, Sanskrit drop or sap, and therefore would mean the giver of rain, corresponds closely to Zeus in his attributes; like him, and like the Norse god Thor, he is the wielder of the thunderbolt. So the bright Vedic goddess Ushas, the dawn, is the Greek Ēōs, the dawn; while Ahanâ, another name for the dawn, is the Greek Athēnē. Odin or Woden (see NORTHERN MYTHOLOGY), the highest of the gods, the All-Father, whose name is connected with the Latin *vadere*, to move, is a counterpart of Zeus and Jupiter, and as such is the god of the sky and of the sunlight, the giver of rain, &c. Thor, the god of thunder, is called the son of Odin, and, as was natural, considering the origin of both of them, they are in some of their attributes identical. Baldr, the bright and beautiful god, is the sun, and the delight of the world in the presence of Baldr is the joy inspired by the bright sunlight; and as the Iliad and Odyssey are claimed as solar myths in their origin, so the Norse Volsunga Saga, and the German Nibelungenlied, are explained in the same way, and the similarity in the main incidents of all of them is pointed to as proof of the fact.

Such is a brief outline of the theory which has been so ably and eloquently expounded and advocated by Prof. Max Müller and Sir G. W. Cox; and that they have established a certain number of their propositions, and have brought forward many plausible if not entirely convincing interpretations of myths, must be admitted. Thus it may now be held as established that myths as a rule are a natural and unconscious growth at an early stage of language and civilization, and that as there was a common language spoken by the different Indo-European races when dwelling together in the heart of Asia, so among these ancient Aryans there was a common store of more or less developed myths, which contained at least the germs of what afterwards became the mythologies of the Hindus, Greeks, and Teutons. Yet as a whole the 'solar theory' cannot be accepted as conclusively proved, and when it is brought in to explain not only such simple stories as those of Daphne, Endymion, and Phaëthon, but also such long and complicated tales as the Trojan war, the return of Ulysses, or the Nibelungenlied, readers are apt to become sceptical as to its value. For in fact the solar theory can be made in the same way to account for the origin of almost any story, and can be applied with about as much success to a novel of the present day as to the Iliad or the Odyssey. Still we may grant that the Iliad, for instance, may have owed its origin to a solar myth, that is, that the germ of the tale of the Trojan war may be solar; yet looking at the story as we receive it from the hands of Homer, it seems impossible to distinguish in it what is purely solar and what is the product of human invention and that inevitable growth and alteration to which all tales orally handed down are subject. But whatever solar elements the story may contain, we cannot doubt that to Homer and the Greeks at any rate it was simply the tale of a war which their ancestors waged for ten years against a foreign foe. To prove that a story is physical in origin it is not enough to show its analogies with natural phenomena, or its similarity to some myth that has been proved to be physical. Such comparisons must always be full of uncertainty unless accompanied by more trustworthy data drawn from a comparison of words, and based on the science of language. No one theory, indeed, can be expected to explain the origin of all myths, for though we may admit that many, perhaps most, of them are physical in origin, it is impossible to deny that others may be pure fabrications, tales invented by early bards or minstrels to beguile a weary hour, while in others fragments of real history may be hidden. To decide what class any myth is to be referred to, we must trace it, if possible, back to its earliest and most rudimentary form, and then, by the aid of the science of language, we may be able to say whether it is physical in origin or not; but as this will in many cases be impossible, there must always remain a number of myths whose origin cannot be settled. See Cox's Tales of Ancient Greece, and Mythology of the Aryan Nations; Max Müller's Lectures on the Science of Language (second series); Chips from a German Workshop; and Essay on Comparative Mythology, in Oxford Essays for 1856; A. S. Murray's Manual of Mythology; Welcker's Götterlehre; Kelly's Indo-European Folklore; Preller's Griechische Mythologie and Römische Mythologie; Grimm's Deutsche Mythologie, &c. See also GREECE (ANCIENT), NORTHERN MYTHOLOGY, &c.

MYTILENE, or MITYLENE. See LESBOS.

MYXINIDÆ, the name applied to the Hag-fishes, one of the two families included in the order Marsipobranchii ('pouch-gilled') of the class Fishes. These fishes are eel-like in shape. The paired fins are totally wanting, but a median fin runs round the posterior margin of the body. The typical Hag-fishes are generally found imbedded in the viscera of other fishes, into which they have literally bored their way by means of the single fang or tooth, of recurved shape, which is borne on the palate. The sides of this tooth are cut into strong serrations or saw-like teeth; and having fixed itself to the body of the victim by means of the suctorial mouth the palatine fang is brought into play, and soon effects an entrance into the body of the prey. There are no jaws, and the mouth is provided with eight 'cirri' or filaments, subserving the sense of touch. The tongue

Myxinoid family the best known are the Common or Northern Hag (*Myxine glutinosa*), so named from the quantity of mucus which it is capable of secreting from the surface of the body. It inhabits the British and Northern seas, and is frequently found imbedded within the bodies of cod and haddocks. The *Myxinoids* possess seven gill openings on each side, like the Lampreys. In *Gastrobranchus* the gill-sacs on each side open into a tube, which terminates in an aperture on the ventral surface of the body below the heart. The Common Hag (see HAG) is also, in some systems of classification, included in the genus *Myxine*, and under the specific name *cæca*.

N.

N, the fourteenth letter and eleventh consonant of the English alphabet, is an articulation formed by placing the point of the tongue against the roof of the mouth, and forcing it through the nostrils. It is a liquid, a semi-vowel, because part of its articulation may be continued for any length of time. It is a nasal letter, the articulation being accompanied by a sound through the nose, caused by the position of the tongue, which forces part of the air in the expiration through that organ. It is a dental, because produced chiefly by the above-mentioned position of the tongue, which has the reader will see from the article L, is nearly the same as in the pronunciation of that letter; in consequence of which persons, who, from neglect, or natural defect, are unable to inflect the tongue so as to pronounce *l*, often substitute an *n* instead of it. In English and most other languages *n* has a pure nasal sound; in French and Portuguese, after a vowel in the same syllable, as *on*, *un*, &c., it has the effect of giving a semi-nasal sound to the vowel preceding, that is to say, the vowel is sounded by an omission of the breath partly through the nose and partly through the mouth. For the etymologist *n* is important, on account of its ready union with other letters, and its frequent omission or insertion between other letters. The same word in the same language often has the *n*, in some of its modifications, before the palatic sounds *g* and *k*, and in others omits it. Thus the original *frago*, *tago*, *pago*, became in later Latin *frango*, *tango*, *pango*, yet *frēgi*, *fractum*, *tĕtigi*, *tactum*, *pĕpigi*, *pactum*, &c., were retained. Thus also *fingere* and *figura*, *fictus*, *figmentum*; *stringere*, *strictus*. From the Latin *lynx*, the German forms *luchs*, the Danes *los*, the Swedes *lo*; for the German *danken* (to thank) and the Swedish *danka*, the Icelandic has *tacka*. It often associates also with the labials *d* and *t*, while other idioms omit it in the corresponding words; thus in Latin, *scindo*, *scidi*; *findere*, *fidi*. In German the introduction of the *n* before *d* is extremely frequent, thus *jugend* (youth); in Low Saxon, *jögd* only; *tugend* (virtue), for the ancient *taugde*; *nackend* (naked) for the old *nacket*. The Italian, on the other hand, frequently drops an *n*, which was found in the original Latin, as in *isola* from *insula*, *istituzione* (as well as *instituzione*) from *institutio*. Before labials *n* is frequently changed into *m*, as in the Latin *impar*, *immittere*; Greek, *symballō*, *emblēmos*. We often find *n* omitted by the Greeks and by the Romans, when not final; thus Cicero writes *Foresia*, *Megalesia*, for *Forensia*, *Megalensia*. On inscriptions we find *IMPESA* for *IMPENSA*, and *MESIBUS* for *MENSIBUS*. In Plautus we find *stas* for *stans*. With the Greeks *n* stood for fifty, and *ν* for 50,000. As a Latin abbreviation *N* signifies *noctes*, *natus*, *nomine*, *nefastus dies*, *numine*, &c., and on medals of the Lower Empire *D N* signifies *Dominus noster*. The Spanish alphabet has a character *ñ*, called *eñe*, with the *tilde*, and pronounced like *ni* in *onion*, *minion*; for instance, *España*, *Nuñez*, *niñez*: *n* preceded by *g* in Italian is pronounced in the same way.

NAAS, a market-town in Ireland, in the county of Kildare, 17 miles south-west of Dublin. It is a very ancient place, was once the residence of the kings of Leinster, and surrounded by walls. There are a Protestant and Roman Catholic church, convent, county jail, barracks, &c. Population (1851), 3808.

NABIS, a Spartan, who succeeded in making himself king on the death of Machanidas (B.C. 207). He was a tyrant, who at first assumed the appearance of being a just prince, but afterwards imitated the Asiatic despots. Every suspected person was immediately put to death or banished. He plundered Messina and Argos, and would have continued to extend his dominion still wider over Peloponnesus by artifice and force, had not the Romans, in alliance with the Achæans, declared war against him. Quintus Flamininus, the Roman general sent against him, compelled him in a short time to sue for peace, but he was still allowed to remain King of Sparta. He was afterwards defeated by Philopœmen at the head of the army of the Achæan league, and was at last killed in Sparta by his own allies, the Ætolians, whom he had called in to his assistance (192 B.C.)

NABOB (a corruption of *nawab*, the plural of *naib*, a deputy), in India, the title of a governor of a province or the commander of the troops; borne, however, by many persons as a mere titular appendage. The nabobs were subordinate to the *subadars*, or governors of a great extent of country (a *subah*). After the invasion of Nadir Shah they made themselves independent of the Great Mogul, but only to fall under the more stringent domination of the British. The term has become proverbial in English, to signify a person who has acquired great wealth in Hindustan, or lives with peculiar splendour.

NABONASSAR, a king of Babylon, with whose reign begins an epoch, called the *era of Nabonassar*. It began on the 26th of February, 747 or 746 B.C.

NABULUS, or NABLUS, a town of Palestine, capital of Samaria, 30 miles north of Jerusalem, built by Vespasian, a little to the west of the Shechem and Sychar of the Bible. It is beautifully situated among gardens, orchards, and fertile fields, along the base of Mount Gerizim. It is the principal residence of the descendants of the ancient

Samaritans. It has manufactures of cotton goods, and a superior soap, and carries on a considerable trade, partly by caravans from Egypt and other countries. Wine is grown, and silkworms are reared in the neighbourhood. The chief objects of attraction to pilgrims are the tombs of Joshua and Joseph, and Jacob's Well, 3 miles distant, on the road to Jerusalem. Pop. estimated at 10,000.

NACRE, or MOTHER OF PEARL. See MOTHER OF PEARL.

NACRITE, a name given to several varieties of white unctuous minerals, which occur usually in mica slate, when, by taking the place of the mica, they convert the slate into a mixture of nacrite and quartz. Nacrite also occurs crystallized as four-sided prisms in granite. It has a pearly, silky, shining lustre, and a specific gravity of about 2·7. Its constituents are 64·440 silica, 28·844 alumina, with occasional and varying portions of lime, and of the protoxides of iron and manganese. Its best known localities are Wicklow in Ireland, and Brunswick in Maine, in the United States.

NADIR, in astronomy, that point of the heavens which is diametrically opposite to the zenith, or point directly over our heads. The zenith and nadir are the two poles of the horizon.

NADIR SHAH, or TAMASP KOULI KHAN, King of Persia, a famous conqueror and usurper, was born in the province of Khorasan in 1688. While still young he gave repeated proofs of his cunning, bravery, and ambition. He served under various governors in Khorasan, whom he tried to subvert, in order to secure the position for himself, and when he was unsuccessful in this, became chief of a band of robbers, at the head of whom he, in course of time, made himself master of several fortresses in his native province. The shah, however, was at this time surrounded by enemies, and as he recognized the military abilities of Nadir, he thought it expedient to overlook his acts of rebellion, and to seek his assistance in repelling his enemies. Nadir undertook the command of the Persian army sent against the Afghans, whom he repeatedly defeated. His final victory was gained near the ruins of Persepolis in 1729. In the following year he fought with success against the Turks, and was honoured with the title of *Tamasp Kouli Khan*. The shah, during his absence, having in person sustained a defeat from the Turks, was induced to make a disadvantageous peace with them, and Nadir was directed to disband his army of 70,000 men. Instead of obeying, he immediately led them to Ispahan, where he seized the shah, confined and deposed him, and proclaiming his son Abbas, then an infant, in his stead, assumed the title of regent. He forthwith renewed the war with the Turks, and recovered all the lost provinces; and the young king dying in 1736, he was raised to the sovereignty. This had only the effect of extending his views; and, being invited by some conspirators about the person of the Great Mogul to undertake the conquest of India, he began his march at the head of 120,000 men, and, with little resistance, reached Delhi in March, 1739. The riches which he found in this capital were immense; but, being exasperated by some tumults on the part of the inhabitants, he caused a general massacre, in which upwards of 100,000 persons perished. After this barbarity the sanguinary victor concluded a peace with the Mogul, whose daughter he married, receiving with her, as a dowry, some of the finest provinces of the empire that were contiguous to Persia. In this expedition it is supposed that he carried away, and distributed among his officers, valuables to the amount of £112,000,000. On his return he waged war with equal success against the princes of Bokhara and Kharismania, so that the boundaries of his empire were extended on all sides. At the height of his power his dominions stretched from the Indus and the Oxus to the Euphrates and the Caspian Sea. In 1743 he renewed the war with the Turks, but peace was concluded in January, 1746. A conspiracy having been formed against him by the commander of his body-guard and his own nephew, he was assassinated in his tent, June 20, 1747, his nephew, Ali Kouli, succeeding to the throne. The conduct of Nadir sufficiently marks his cruelty, ambition, and rapacity. His most favourable feature appears to have been a disposition to religious toleration. On his accession he required certain curses pronounced annually on the caliphs preceding Ali, and other incentives to religious strife, to be dispensed with.

NÆNIA, or NENIA (Latin), a funeral song among the ancients, sung generally by women at interments. As they were composed by the persons who sung them, and were rather unmeaning, the word came to signify any trifling, unmeaning song. *Nænia* was also the goddess of lamentation, and had a temple before the Viminal Gate.

NÆVIUS, CNEIUS, one of the most celebrated among the earliest Roman poets, was born in Campania between 274 and 264 B.C., and wrote tragedies and comedies after the model of the Greek. He also wrote an epic poem upon the Punic war, and another in imitation of the Cyprian Ilias. By the introduction of some of the Roman nobility into his comedies he provoked their anger, was banished from the city, and retired to Utica. He died B.C. 204 or 202. Fragments only of his works have come down to us. The best edition is by Klussman (Jena, 1843).

NÆVUS, or 'MOTHER'S MARK.' This disfigurement, which occurs most frequently on the head and trunk, but may also appear on the extremities, consists essentially of an enlargement of the minute veins, or venous capillaries, which are dilated, and anastomose or unite among themselves to form a vascular patch generally of a deep-red colour. The lesion or abnormality is confined to the upper layer of the *cutis* or true skin. No pulsations are observable in the nævus, but if the circulation in the neighbourhood is obstructed in any way, turgescence is seen, and the colour deepens. The familiar name of 'mother's mark' or 'longing mark,' applied to nævus, is applied from the popular belief that the lesion was the result of fear, fright, unnatural longing, or some such irritation acting upon the mother's constitution, and communicating its effects to the unborn child, in the shape of this mark. The arguments against this absurd belief will be found fully stated in the article MONSTER. Nævus, apart from questions as to its exact *cause*, appears to be invariably congenital in its nature, and never to occur as the result of disease or accident. After birth it usually enlarges, and after attaining a certain size may remain to constitute a permanent lesion, or it may be absorbed with or without inflammatory action. Nævus has been treated in various ways, such as by ligature, caustics, &c. The ligature is now most commonly employed by surgeons for its removal, threads being passed under the base of the nævus, and tied so as to produce strangulation of the vessels. In cases where a nævus is of limited extent, and does not produce disfigurement, or where from its situation it may not be seen at all in ordinary circumstances, the surgeon's advice generally is to 'let well alone.' In a variety of nævus, known as the *subcutaneous* kind, the lesion is more deeply seated than the former variety. The subcutaneous nævus generally accompanies the more superficial kind, but may bleed spontaneously, and weaken the patient unless removed by the ligature.

NAGASAKI, or NANGASAKI, a city and port in Japan, on the west coast of the island of Kiusiu, beautifully situated on a peninsula at the extremity of a bay or harbour, affording a safe and excellent anchorage, and inclosed also by hills, up the sides of which a considerable portion of the town extends. It presents a most enchanting aspect from the water, the hills adjoining it being covered with the most luxuriant verdure, from the midst of which gleam numerous white temples and thatch-roofed cottages. The streets are well paved in the centre, and kept exceedingly clean, while each house has a garden attached, and is encircled by a verandah. The climate is mild and healthy. The mean annual temperature is about the same as that of Rome or Florence. In the months of June and July heavy rains fall. Previous to 1859 the only European nation allowed to trade here was the Dutch, which has maintained commercial relations with the town for the last 200 years. In that year Nagasaki was one of five Japanese ports opened to the British and Americans, as well as the Dutch; and in October, 1859, it and seven other Japanese ports were opened to most of the European nations, besides the United States. The exports are copper, silk, camphor, tobacco, porcelain, and lackered wares, and the imports sugar, oil, hides, zinc, tin, lead, iron, coal, raw cotton, and cotton and woollen manufactures. In 1882 the total value of the exports in the foreign trade was £633,343, and that of imports £662,678. In the same year 385 non-Japanese vessels of 266,118 tons burden, of which 261 vessels of 188,997 tons belonged to the United Kingdom, entered the port of Nagasaki. A dry-dock measuring 460 by 89 feet was opened here in May, 1879. Pop. in 1881, 39,566.

NAGPUR, NAGPOOR, or NAGPORE, a town in India, in the Central Provinces, capital of the Gondwana country, and of the division of Nagpur (area, 24,040 square miles; population, 2,758,050), 440 miles E.N.E. of Bombay. It occupies a low swampy flat, and covers an area about 7 miles in circuit. From the number of trees interspersed over all parts of its site, it might at a distance almost be mistaken for a forest; when more nearly approached it is found to be little better than a vast assemblage of huts straggling or huddled together in the most irregular manner. Close to the suburbs on the west are the Sitabaldi Hills, where there is a small cantonment and the British residency is situated. There are other cantonments at Takli, 2 miles distant, and at Kamptbi, 9 miles distant. This last is the principal one. They are celebrated as the scene of a desperate struggle, in which a mere handful of British troops, when treacherously attacked by the rajah Appa Sahib in 1817, with a body of about 18,000 men, not only held their ground, but gained a signal victory. Many of the inhabitants are wealthy bankers; but the employment of the greater number is in manufacturing cotton and woollen cloths, and utensils of copper, brass, and other alloys. A bed of coal, estimated to contain 17,000,000 tons, at a depth of 200 feet, has recently been discovered at Nagpur. There is a trade in opium, hemp, and above all, in cotton, for which this is a great mart. Nagpur was formerly the seat of a line of rajahs, which became extinct in 1853, when their territory was annexed to the British dominions. Pop. 98,299.—Besides the division or commissionership of Nagpur mentioned above, there is an executive district of the same name, with an area of 3786 square miles, and a population of 697,356.

NAGYAGITE. This mineral occurs at Nagyag and Offenbanya in Transylvania, and in Virginia, United States. It consists essentially of telluride of lead and gold; besides these elements it generally contains also copper, silver, and sulphur, and sometimes also antimony. The following numbers represent the average composition of this mineral:—

Sulphur.	Tellurium.	Lead.	Gold.	Silver.	Copper.
9·70.	30·09.	50·95.	9·10.	0·53.	0·99.

Agreeing with the formula $Pb Au_2 Te_8$.

Nagyagite crystallizes in dimetric forms, $0P.2P_\infty.P$, in which the length of the principal axis is 1·295; its specific gravity varies from 6·85 to 7·2. The colour is blackish lead-gray; it has a metallic lustre: it melts easily before the blowpipe, and burns with a blue flame.

NAHUM, one of the twelve minor prophets, whose prophecies relate to the destruction of Nineveh, which he describes in vivid colours. His object, according to some late German writers, seems to be to represent to his nation, groaning under the oppression which they had suffered from the Assyrians, the total destruction of the haughty capital, as a just punishment of Jehovah. The period in which he lived is, however, uncertain, some placing it before, and some contemporary with, that event.

NAIA, or NAJA, a genus of serpents included in the family Elapidæ (Venenosa) of the Colubrine section of the serpent order (Ophidia). The best known examples of the genus are the *Naja tripudians* (older name, *Vipera naja*) or Hooded Snake, the Cobra di Capello of India (see COBRA DI CAPELLO); and the *Naja Haje* of Egypt. The Elapidæ possess a short head of rounded shape. Large scales or *scuta* cover the upper aspect of the head, and the nostrils are borne on the sides of the snout near its extremity. The cervical or neck-ribs can be raised or depressed at will, and the skin covering these ribs is disposed loosely and in folds, so as to give the animal a hooded appearance; and from this peculiarity the familiar English and Portuguese names, given above, are derived. The general form of the body is rounded, the tail being thin and tapering to a point. The belly is protected by scuta, which on the under surface of the body, at its middle, are disposed singly and in a transverse manner; whilst on the under aspect of the tail they form a double row. The poison fangs, as in all the Venenosa, are situated in front of the upper maxillæ, and there are solid teeth of small size placed behind the fangs. In the *Naja* the fangs are of comparatively small size. The cobra di capello is sometimes known as the 'Spectacle Snake' from the presence of a mark situated on the back of the hooded neck, and somewhat resembling a pair of spectacles. The Egyptian Haje wants the spectacled-mark on the back of the hood possessed by its Indian neighbour, to which, in most other, and in all essential structural features, it is closely allied. The Haje is tamed by Egyptian jugglers, and some authorities have maintained that this snake was the 'asp' employed by Cleopatra to effect her own untimeous end.

NAIADS (from the Greek *naō*, to swim), in the Greek mythology, nymphs of fountains and brooks. The notions and tales of the ancients concerning the Naiads resemble, in some points, those which the northern mythology gives us of the Nixies. The Naiads are represented as beautiful women, half draped, with long flowing hair, with their heads crowned with rushes, and reclining against an urn, from which water is flowing. These were supposed to inspire those who drank from the waters with oracular powers and the gift of poetry.

NAÏDIDÆ. A group of worms, associated with the familiar Earthworms in the order *Oligochæta* (or *Terricola*) of the class Annelida. The Naïdidæ are 'water'-worms, and inhabit most of our ponds, streams, and ditches. The little red-coloured worm or *Tubifex rivulorum*, averaging about an inch in

length, is a familiar example of this group, as also is the *Nais filiformis* and the *N. proboscidea*, both common denizens of fresh-water pools. These forms are all hermaphrodite. In the course of growth from the young to the adult stage the Naïdidæ exhibit a peculiar phase, involving a non-sexual reproductive process of budding. Thus before the sexual organs characteristic of adult life are developed, a bud may be thrown out between two of the middle joints of the body. This bud grows rapidly, and becomes developed to form a complete and separate Naïs, and the two portions of the parent-body, the one anterior and the other posterior to the budding-point, also become separated, each to form a distinct individual. In this way the Naïs, in itself immature, becomes, through processes of budding and fission, three separate individuals. This curious condition of matters may be further complicated by the further development from the one joint of secondary or complemental buds prior to the detachment of the first formed bud; and these buds may remain temporarily connected, being nourished through the head and anterior segments of the original or parent body. When sexually mature, and with the development of the reproductive organs, these asexual processes cease.

NAILS (OF ANIMALS). The nails, like hairs, belong to the category of the exoskeletal elements of the animal frame, or as parts of the skin, of the outer layer of which they are modified appendages. A nail, in fact, may be regarded as a specialized arrangement of the cells of the epidermis or outer skin. At the root of the nail the deeper layer or true skin is developed to form the *matrix* of the nail. This matrix exists in the form of a vascular fold of the *corium* or true skin, and exhibits an arrangement of parallel ridges, invested with epidermic cells of an actively-growing type. These cells gradually assume a flattened shape, become of horny texture, and coalesce to form a smooth, continuous horny structure, which becomes the nail. Continual additions are thus being made to the nail from behind, and also from the superior and inferior aspects of the growing point. The flat surface of the matrix, which is in apposition with the opposed surface of the nail, adds to the thickness of the nail; and the growth of the structure is thus provided for, so long as its surface is in contact with the matrix, and before the nail is pushed out by the process of growth, and freed from its secreting tissues. The vascular papillæ of the matrix nearest the root of the nail are less prominent than those towards its body. Hence near its root the nail is lighter in colour, and this latter portion has been termed the *lunula*, from its somewhat crescentic shape. In chemical composition the nails exhibit an albuminous substance, with from 6 to 8 per cent. of sulphur. The nails, according to Mulder, contain more carbon and sulphur than the epidermis itself. In man the nails do not inclose the ends of the digits; but as in the horse, and 'hoofed' or ungulate quadrupeds generally, the nails assume the form of protective coverings to the digits, and are then known as 'hoofs.' Nails may be produced to form 'claws,' as in birds and carnivorous mammals. In the sloths the nails assume a large relative size, and are used as a chief means in arboreal progression. In the Amphibia—as in some toads, efts, &c.—the nails are represented in their simplest form, and appear as mere thickenings of the skin at the extremities of the digits. The nails appear about the fifth month of fœtal or embryonic life. They may be affected by disease in the surrounding parts. Such affections have received different names from pathologists. Thus the name of *fissura unguis*, or splitting of the nail, is given to a rent in it from its open edge to its root, caused by cuts and bruises, or by a generally diseased state of the body, as in the remarkable *plica polonica*, or Polish disease, syphilis, &c. *Incarnatio unguis*, or fleshing of the nail, is a name applied to an inflammation and suppuration of the soft parts surrounding the nail, caused by its widening out excessively, and consequently growing into the flesh. The pressure thus produced is very painful, often lasts a long time, and even when removed by a tolerably painful operation is very apt to return. The other most common diseases of the nail are: *panaritium subungue*, produced by a whitlow at the extremity of the finger, and which, often causing an entire loss of the nail, requires careful treatment; *tinea unguis*, in which the nail becomes wrinkled up and full of clefts, and sometimes even drops off entirely; and *gryphosis*, or a degenerate form of the nail, by which it grows stronger, longer, and thicker, and becomes crooked like a claw. This is usually caused by some general disease of the skin.

NAILS, small pointed pieces of metal, generally with round or flattened heads, used for driving into timber or other material for the purpose of holding separate pieces together. They are of many different lengths and shapes. Brads used for nailing floors and ceilings have the head only on one side; the small sharp nails with round flat heads, used by saddlers and upholsterers in attaching cloth or hangings, are called tacks; the small sharp taper nails without heads, used by shoemakers, are called sprigs; a variety in which the head is large and the spike small are called hobnails; very large nails are called spikes. Until a comparatively recent period almost every kind of nail was produced by hand labour alone; each nail was separately forged from a thin rod of iron. These *wrought* nails, as they are called, are preferable, for many kinds of carpenter work, to those made by machinery, and there is no reason to anticipate the total abandonment of the process. The making of wrought nails retains, in many places, the character of a domestic manufacture, the workman getting his material sent to his residence, and being often assisted by the female members of his family. The nail rods are either cut from plate-iron by rolling shears, or rolled from malleable-iron into bars of the required thickness. Putting the ends of three or four of such rods into the forge-fire at once, the nailer begins his work by withdrawing one when it is sufficiently heated, and forging its end upon a small firmly-bedded anvil to a tapering point. The pointed end is then cut off to the required length (adjusted by a gauge) by being laid upon a fixed chisel, and getting a smart stroke from the hammer. The nail is then dropped point downwards into the bore, which is a piece of iron 10 or 12 inches long, with a perforated steel knob at each end. The holes are so made as to fit the thicker part of the nail, and are countersunk at the upper ends, so as to make a kind of mould for the nail head. A few well-directed blows upon the projecting end of the spike, and a head is hammered up into any required shape. As this process is comparatively slow and expensive, nails have been manufactured by the cheaper process of casting; but they were found so brittle as to be of no use, except for a few coarse purposes. In 1810 a machine was contrived by which nails could be cut from an iron sheet, and headed at one operation, at the rate of 100 per minute. Great improvements have since been made upon this machine, both as to the quality and quantity of work turned out. In the process now generally followed sheet-iron of the required thickness is first cut into strips of a breadth equal to the intended length of the nails. These strips are then applied to a machine in which a chisel-shaped cutter descends with sufficient force to cut from the end of the strip a narrow piece of the

Names, Roman. The Romans had originally but one name, as Romulus, Numa, &c. but when the people increased, they found it necessary to add a second name, to distinguish the different families. Thus, Romulus had a son called Julus, and his descendants were called Julii; Numa had a son called Pompilius, and his descendants were called Pompilii, &c. To distinguish the different persons of the same family, a third name was added, as Publius Cornelius Scipio, Lucius Cornelius Sylla, &c. To these names were sometimes added others, derived from some remarkable circumstance, as Africanus, Asiaticus, Metellus, Macedonicus, &c. In Old Testament times the same was often changed on the occasion of any remarkable event in one's life. Abram became Abraham, Jacob becoming Israel, and so on. Not only the Hebrews, Egyptians, Assyrians, Babylonians, Persians and Greeks had surnames; and in the earliest period of their history the same may be said of the Romans. In course of time, however, every Roman had three, the praenomen or personal name, which was placed first, and commonly written with one or two letters, for example C. for Caius, or Gaius, M. for Marcus, Q. for Quintus, and so on. That followed the nomen, the name of the gens or clan, as Cornelius, Julius, Fabius, from the

Cornelian, Julian, and Fabian gentes. Lastly came the cognomen or family name, as Cicero, Cæsar, Scipio, &c. Conquerors were occasionally complimented by the addition of a fourth name or agnomen, commemorative of their conquests, as Coriolanus, Africanus, Germanicus, &c. While the earliest Greek names were expressive of some quality in high estimation, as Callimachus (excellent fighter), Apollodorus (gift of Apollo), the Roman names were less dignified and ambitious in their origin; thus Porcius (swineherd), Cicero (vetch grower); some from personal peculiarities, as Naso (long-nosed), Paulus (little), Crassus (fat), Cocles (one-eyed). Celtic and Teutonic names had often equal significance, as Gottfried (God's peace), Conrad (bold in counsel), Bertha (brightness), Ethel (noble), &c. Times of great public excitement have had a very considerable influence in modifying the fashion in names. Thus the English Puritans preferred Old Testament names and such as directly expressed religious sentiment. Among the Scottish Covenanters Old Testament names were also prevalent. At the French Revolution the names of the most famous Greek and Roman republican heroes were in general favour.

The principle of the modern system of personal nomenclature now adopted in most countries in Europe is to have one name for the individual (Christian or baptismal name) joined to a second name which is common to the family to which he belongs (surname). It is impossible to state with any degree of certainty when this system became general. No instance is known, we believe, of any English family bearing a fixed name from generation to generation. They were introduced by the Norman adventurers, but were for centuries confined to the upper classes. Surnames became general in Scotland about the twelfth century. In some of the wilder districts of Wales they can hardly be said to have been adopted even yet. The principal sources from which surnames are derived are personal characteristics, rank, or profession, localities, animals, or natural objects, and patronymics. Thus from the first source, personal characteristics, we have Black, Brown, Grey, Green, Whyte; Little, Long, Short, Broadhead, Lightfoot, Cruickshank. From rank or profession we have King, Prince, Pope, Bishop, Abbot, Prior, Stewart or Stuart, Smith, Wright, Carpenter, Taylor, Baker or Baxter, Weaver or Webster, Falconer, Fletcher (arrow-maker), Glover, Bowman, Chapman or Marchant, Miller, Brewer or Brewster, Shepherd. From localities, animals, or natural objects, come Hill, Dale, Wood, Forest, Brookes or Burns, Grove, Shaw; Bird, Lyon, Hogg, Crabbe, Fox, Roebuck, Bull; Stone, Tree, Flint, Steele. From patronymics are derived Andrews, Anderson; Alexander, Sanderson, Sandison; James, Jameson, Jamieson; Jones, Johnson, Jonson, Jackson; Williams, Williamson, Wills, Wilson; Thom, Thomson; Roberts, Robertson, Robinson. Surnames in many other languages are derived from like sources; thus Black, Whyte, Brown, are with the Germans Schwartz, Weiss, Braun; with the French, Lenoir, Leblanc, Lebrun; the Gaelic prefix Mac, the Irish O', the Norman-French Fitz, the German affix sohn or son, the Scandinavian sen, the Russian vitch, are all equivalents of the English affix son. The Hebrews, as already stated, had no surnames proper, nor had the Arabians; but to distinguish two men of the same name the former used the form Solomon ben David (Solomon son of David), and the latter Abraham ibn Esra (Abraham son of Esra). The Welsh used the word ap in the same way; Evan ap Richard (John son of Richard).

In Britain and most continental nations the wife changes her surname on marriage to that of her husband; in Spain, however, she retains it, while the son may adopt either the paternal or maternal name. In this country a man may now change his Christian name and surname without an act of Parliament, royal license, or even public advertisement; but there is no law to compel third parties to use the new name. See Miss Yonge, History of Christian Names (London, 1863); C. W. Bardsley, English Surnames (second edition, London, 1874); Professor Innes, Concerning some Scotch Surnames (Edinburgh, 1860).

NAMUR, a province of Belgium, bounded on the north by Brabant, north-east by Liége, east by Luxemburg, south and south-west by France, and west by Hainaut; greatest length, north to south, 57 miles; greatest breadth, 37 miles; area, 1413 square miles. The surface of this province is greatly diversified, exhibiting alternately mountain and valley, wide level plains, and wooded heights. In many parts, particularly on the banks of the Meuse and Sambre, the scenery is very picturesque. Almost the whole province belongs to the carboniferous system, and is characterized by its usual strata of limestone, sandstone, shale, coal, and iron. The province is well watered by the Meuse, with its tributary the Lesse, proceeding from the south, and the Sambre from the west, uniting at Namur, and then flowing east. About one-half of the whole surface is cultivated. The chief vegetable productions are the ordinary cereals, oil-seeds, chicory, fruit, and medicinal and dye-plants. In some places the vine is cultivated. The extensive forests furnish good timber. The industry of the province, both manufacturing and commercial, is largely developed. Its cutlery is particularly famous. For administrative purposes Namur is divided into three arrondissements—Namur, containing the capital of the same name; Dinant, and Philippeville; subdivided into sixteen military and fifteen civil cantons. Namur was an independent county as early as the tenth century. At the close of the twelfth century it came into the possession of the counts of Hainaut, and early in the thirteenth century fell to Peter of Courtenay, emperor of Constantinople. It was sold by his son Baldwin to Guy of Dampierre, count of Flanders, with whose descendants it remained till 1420, when it was purchased by Philip the Good, duke of Burgundy, for 132,000 gold ducats, and afterwards shared the fate of the other Burgundian states. Pop. (end of 1881), 324,427, nearly all of whom speak Walloon.

NAMUR (Flemish, *Naemen;* German, *Namen*), a town of Belgium, capital of the above province, at the confluence of the Sambre and Meuse, 35 miles south-east of Brussels. It is surrounded by walls, and is defended by good outworks on both banks of the Meuse and Sambre, and also by a citadel seated on steep rocks, rising up at the confluence of the two rivers. It is entered by four principal and seven minor gates; and maintains a communication between its different quarters by means of two bridges —one across the Sambre, and another across the Meuse. The town is beautifully situated and well built, with spacious streets and several handsome squares. Frequent sieges and bombardments have deprived the town of almost all its ancient buildings. Among those of more recent times are the cathedral dedicated to St. Aubin, one of the most handsome modern churches of Belgium; the church of St. Loup, the church of Notre Dame, the Hôtel de Ville, and the belfry tower. Namur is the seat of a bishop; it possesses a chamber of commerce, a royal athenæum, a Jesuit college, an academy of painting, a conservatory of music, a school of design and architecture, a public library, a museum, a chemical laboratory, an agricultural society, an Episcopal, normal, and various other schools, a penitentiary, a deaf and dumb asylum, and other benevolent institutions, an arsenal,

and barracks. Namur is famous for its cutlery, its leather-works, and its iron and brass foundries. The trade is greatly favoured by the two navigable rivers. Steamers ply on the Meuse; and railways communicate with Brussels, Mons, and the French frontier. Namur dates from the seventh century, under the names of Namucum, Navinucum Castrum, and Namon. It was taken by Louis XIV. in 1692, and retaken by William III. of England in 1695. Its fortifications were demolished by Joseph II. of Austria in 1784, and restored in 1817. Pop. 25,766.

NANCHE, a town in China, province of Chekiang, in a beautiful valley, where the Hwuy-chow is joined by one of its affluents, 40 miles west of Yen-chow-foo. It is about 3 miles in circuit, is neat and clean, very much like an English town, and consists of houses, generally of two stories, ranged along the banks of the stream, which is covered with boats constantly plying to Yen-chow, Hang-chow, and many places both above and below. Pop. about 200,000.

NANCY, a town of France, capital of the department Meurthe-et-Moselle, finely situated in a fertile plain, near the left bank of the Meurthe, 177 miles east of Paris, on the railway to Strasburg. It is one of the prettiest towns in France. It is divided into the old and the new town. The former is for the most part irregularly built, with streets narrow and winding; but several of the buildings are elegant, and not a few of them compensate, by their antiquity, for the want of uniformity in their structure. The new town is remarkably elegant, with streets straight and spacious, intersecting each other at right angles, and the houses, almost without exception, handsome. The Place Royale or Stanislas, surrounded by six or seven fine public buildings, and communicating, by a triumphal arch, with the Place Carrière, has seldom been surpassed. The principal edifices are the cathedral, a modern structure in the Italian style; the church of St. Epvre, with a lofty tower and a fine portal; the church of the Cordeliers, built in 1484, and containing the tombs of several dukes of Lorraine; the ducal chapel, entered from the church of the Cordeliers, and built in the form of an octagonal mausoleum; the Hôtel de Ville, the university, royal college, theatre, barracks, museum, library, and several hospitals. In the Place Royale is a fine statue of Stanislas Leszczynski, king of Poland, who passed the latter years of his life here as Duke of Lorraine, and bestowed upon the town many of its finest modern embellishments. The Cours d'Orleans, occupying the highest part of the town, and finely planted, is the principal promenade. Nancy is the see of a bishop, possesses courts of first resort and commerce, a consulting chamber of manufactures, an academy of sciences, a secondary school of medicine, a botanical garden, a school of design, a theological seminary, &c. The manufactures consist of broad-cloth and other woollen stuffs; hosiery, lace, all kinds of embroidery, stained paper, &c. There are also numerous cotton-mills, dye-works, and tanneries. The trade is in corn, wine, brandy, leather, wool, &c. The most memorable event in the annals of Nancy is the battle fought under its walls, when the Duke of Burgundy (Charles the Bold) was signally defeated and slain by René II., duke of Lorraine. On August 12, 1870, it surrendered to the Germans, by whom it was occupied until 1st August, 1873. Pop. in 1872, 52,978, in 1881, 73,225, the increase being chiefly due to the influx of Alsatians who preferred to retain their French nationality after the annexation of Alsace to Germany.

NANGASAKI. See NAGASAKI.

NANKEEN, or NANKIN, a sort of cotton cloth, which takes its name from the city of Nanking, where it was originally manufactured. It was formerly imported extensively from China, and was used for making ladies' corsets and gentlemen's trousers and vests, but in Britain, at least, it has been superseded by other fabrics. It is now imitated in most other countries where cotton goods are woven: but those of the East are superior, on account of the natural colour of the cotton (*Gossypium religiosum*) being brownish-yellow, while in those countries where white cotton is used it is necessary to give it the proper hue by artificial means. The English manufactures have now so completely driven the Chinese from the market, that large quantities are shipped from this country to Canton.

NANKING (officially, *Kiangning*, that is, Southern Capital), a celebrated city, China, capital of the province of Kiangsu, near the right bank of the Yangtse-Kiang, 560 miles south by east of Peking. It is 18 miles in circumference, and is surrounded by a wall, generally above 40 feet high. The river opposite the city is 1½ mile broad, 25 fathoms deep, with a rocky bottom, and a current of 3 miles to 5 miles an hour. The city lies 3 miles south from the Yangtse-Kiang, but a part of its walls approaches within 700 paces of the water. The principal streets are of moderate breadth, clean, well paved, and lined with handsome shops; but the houses are, in general, mean, and only one story high. The part of the city occupied by the Manchoos is separated by a cross wall from the Chinese town. The great extent of the wall renders the defence of the city difficult; besides which, it is overlooked from the hills on the east. On that side there are three gates; the land towards the river is marshy, and the gates are approached on stone causeways. A deep canal or ditch runs up from the river directly under the walls, on the west, serving to strengthen the approaches on that side. There are, in the city, extensive manufactories of fine satin and crape, and the cotton cloth which foreigners call Nankeen derives its name from this city; paper and ink of fine quality, and beautiful artificial flowers of pith paper, are produced here. Nanking is celebrated also for its scholars and literary character, as well as manufactures, having many large libraries and book stores. It is the residence of the governor-general of three provinces, and, consequently, the centre of a large concourse of officials, educated men, and students seeking for promotion.

Nanking was at one time the capital of the Chinese Empire; but when the seat of government was transferred to Peking, about the end of the thirteenth century, it lost its importance, and a great part of its population; about a third of its area being, it is supposed, now unoccupied. The ancient wall of the city can be traced for 35 miles, but all its ancient palaces have disappeared; and the only remarkable remains of royalty now extant are some sepulchral statues situated near the walls. The famous porcelain tower of 9 stories, and 200 feet in height, completed in 1432, and destroyed during the Taiping rebellion, is said to be now completely restored. It was at Nanking that the British compelled the Chinese to submit to their terms of peace in 1842. The city was held from the spring of 1853, to 19th July, 1864, by the Taipings, who made it their capital. At its capture by the rebels and recapture by the Imperialists it suffered severely. Pop. estimated at 400,000.

NANTES, a town of France, capital of the department of Loire-Inférieure, on the right bank of the Loire, where it receives both the Erdre and the Sèvre, 269 miles west-south-west of Paris, with which it is connected by railway. The Loire here forms a number of islands, two of which are among the finest quarters of the town; the communication between the different parts of which is kept up by at

least sixteen bridges. The situation, on an important navigable river, within 40 miles of the ocean, is advantageous for commerce; and the whole town is so well placed, and so regularly, and in some parts so splendidly built, that it justly ranks as one of the finest towns in France. It has a number of elegant squares; and its quays, which line the banks of the rivers, extend nearly 2 miles. The public edifices most deserving of notice are the cathedral, externally an unsightly pile, from the unfinished towers not rising much higher than the roof, but possessed of fine portals, richly sculptured, although the sculptures have unfortunately sustained considerable damage; the castle, an enormous mass of irregular buildings, flanked with round towers; the Hôtel de Ville, the exchange, the theatre, museum of natural history, picture gallery, old mint, now occupied by the courts of justice; public library, the chapter-house, and Hôtel Dieu or infirmary. Nantes is the see of a bishop, and possesses courts of first resort and commerce, a chamber of commerce and exchange, a college, diocesan seminary, and secondary ecclesiastical school; a secondary school of medicine, and a hydrographical school of the first class. The manufactures consist of woollen covers, serge, flannel, printed stuffs, canvas, varnished hats, marine cordage, chemical products, glue, ship biscuits, &c.; there are also cotton-mills, numerous sugar-refineries, and bleach-fields. The building-docks are of great extent, and fit out vessels from 1000 tons and under, which have long borne a high name for their sailing properties. Nantes is the fourth in importance of the French ports for the number of vessels employed, and the third for the amount of customs duties paid. The trade is greatly favoured, not merely by the river, but by a canal which communicates with Brest, and more recently by the railway which connects Paris with the west coast; it includes a great variety of articles both for the home, the colonial, and the foreign markets. Before the conquest of Gaul by the Romans, Nantes was the capital of the Nannetes. In 445 it valiantly withstood a siege of 60 days by the Huns. During the ninth century it was thrice taken by the Normans, and almost entirely ruined. In 1118, when it had again become prosperous, an accidental fire reduced the greater part of it to ashes. During the English wars in France it suffered much, repeatedly falling into the hands of opposite parties. For a long time it formed one of the most valuable possessions of the dukes of Brittany, but in 1499 the heiress of the dukedom, Anne of Brittany, who was born here, having here married Louis XII., it passed, with the rest of her possessions, to the crown of France. The most memorable event connected with the history of Nantes is the famous edict issued here by Henry IV., April 30, 1598, securing the Protestants in the free exercise of their religion, and making them eligible to all civil and military employments. The revocation of this edict by Louis XIV. in 1685 involved the kingdom in disasters from which it has never completely recovered. Pop. in 1881, 124,319.

NANTUCKET, an island of Massachusetts, south of the peninsula of Cape Cod, from which it is distant about 20 miles. It is about 90 miles S.S.E. of Boston. The island is 15 miles long, and its widest part is 11 miles. The town of Nantucket is situated at the entrance of a deep bay on the north side of the island, and has an excellent harbour, being capacious, deep, and nearly land-locked by two projecting points of beach. A great part of the inhabitants are Quakers. Little attention is paid to agriculture; and the sheep and cows of all the inhabitants feed in one great pasture. The right of the island was originally granted by William, earl of Stirling, to Thomas Mayhew, and conveyed by him to nine proprietors, who divided it into twenty-seven shares in 1659. It is mostly a joint property to this day, although the number of shares has increased to more than 3000. The inhabitants are mostly concerned in the whale-fishery, which has, however, greatly declined of late years, and many people have left the island. The amount of shipping has also greatly decreased. Population in 1880, 3726.

NANTWICH, a market-town of England, in the county of Chester, and 19 miles south-east of the city of that name, 4 miles south-west from Crewe, on branches of the London and North-Western and Great Western Railways, both of which have stations here. There is a fine cruciform church, besides several Dissenting places of worship. It was once famous for its salt-works, but at present its staple manufacture is shoes. Pop. (local board district), 7495.

NAPHTALI (Hebrew, my wrestling), the sixth son of Jacob, and the head of one of the twelve tribes. His mother was Bilhah, Rachel's handmaid. In the blessing of Jacob given to his children on his death-bed, according to the Authorized Version, Naphtali is called 'a hind let loose, and one that giveth goodly words.' This passage has given much trouble to commentators. Ewald translates the Hebrew, 'Naphtali is a towering terebinth. He hath a goodly crest.' If this rendering be accepted, the blessing would be a predictive allusion to the situation of the tribe at the very apex of the country, to the heroes who towered at the head of the tribe, and to the lofty mountains on whose summits their strongholds were perched. The tribe had its full share in repelling the incursions of the Canaanites during the first centuries of the conquest, and is specially mentioned in the song of Deborah (Judges v. 18), which celebrates the victory of Barak. The tribe disappears from history when Tiglath-pileser overran the north of Israel, and bore away the whole of the population to Assyria. Under the title of Galilee, the district occupied by the tribe became in New Testament times more famous than it had ever been before. It was the home of our Lord, and the native place of most of the apostles.

NAPHTHA. This is one of those words used by chemists in a somewhat vague sense. Formerly many liquids, all of which were volatile, mobile, strong smelling, and inflammable, were included under this name naphtha. Subsequently the name was restricted so as to include only the liquid hydrocarbons which issue from the earth in various localities. In more recent years the significance of the name naphtha has been again extended; it now includes most of the inflammable liquids which are produced by the dry distillation of organic substances.

Mineral or Native Naphtha is an inflammable liquid which issues from the earth in Canada and other parts of North America, in Persia, at Rangoon, &c., and associated with solid bitumen or asphalte in the great pitch lake of Trinidad. Native naphtha consists of a mixture of hydrocarbons, chiefly belonging to the paraffin series, but it also contains members of the olefine and of the benzene series.

Boghead Naphtha, which is also known as *photogen* and *paraffin oil*, is obtained by the dry distillation of Torbanehill mineral, or indeed of any cannel coal or bituminous shale. Besides liquid hydrocarbons this naphtha contains various acid and basic compounds, and also solid paraffin, which is held in solution by the fluid hydrocarbons. Paraffin oil may be separated into a great many substances, very similar to those obtained from native naphtha.

Coal Naphtha is obtained by the distillation of coal-tar. After the *light oil* has been separated it is agitated with sulphuric acid, allowed to settle, the supernatant liquid run off and rectified. This liquid

…

…

…

Martius yellow is *dinitronaphthol* ($C_{10}H_4(NO_2)_2O$). *Naphthaline violet* and *naphthaline blue* are also known in commerce.

NAPHTHYL AND DERIVATIVES. The name naphthyl has been applied to the hypothetical radicle $C_{10}H_7$ supposed to exist in naphthylamine, &c.; but as this radicle cannot, according to the generally received notions concerning atomicities, exist in the free state, each atom, at the moment of its liberation from compounds, combines with another atom to form the molecule

$$\begin{matrix} C_{10}H_7 \\ | \\ C_{10}H_7 \end{matrix} \text{ or } C_{20}H_{14}.$$

To this hydrocarbon the name of naphthyl is now generally applied. Naphthyl may be prepared from naphthalene by the removal of part of the hydrogen of the latter body, thus—

$$2C_{10}H_8 - H_2 = C_{20}H_{14}.$$

Naphthyl sublimes in colourless scales, from a solution in ether-alcohol it crystallizes in octohedra, it melts at 154°, and boils above 350°. By the action of bromine on naphthyl a series of substitution products is obtained. The derivatives of naphthyl are very many; one of the most interesting is *naphthol* or *naphthyl alcohol* $C_{10}H_7(OH)$, from which again various derivatives, as dinitronaphthol ($C_{10}H_4(NO_2)_2O$), oxynaphthol ($C_{10}H_6(OH)_2$), &c., are found. The former of these compounds possesses the power of dyeing silk and wool in all shades of yellow from light lemon to deep gold yellow. Another compound into which the radicle naphthyl is supposed to enter is *Naphthylamine* ($C_{10}H_9N$), which may be regarded as ammonia in which one atom of hydrogen is replaced by naphthyl ($C_{10}H_7.NH_2$). This body is best prepared by reducing nitronaphthalene (see NAPHTHALENE) by the action of nascent hydrogen, thus—

$$C_{10}H_7NO_2 + H_6 = C_{10}H_7NH_2 + 2H_2O.$$

Naphthylamine crystallizes in silky colourless needles, which melt at 50° and distil about 300° without decomposition. A solution of this substance colours deal-wood intensely yellow. By treatment with oxidizing agents (stannic chloride, mercuric chloride, &c.) naphthylamine is converted into a violet red colouring matter, from which again a series of splendidly crystallized colouring matters may be obtained. For a further description of these colouring matters see NAPHTHALENE.

NAPIER, SIR CHARLES JAMES, a distinguished military commander and administrator, born on the 10th of August, 1782, obtained an ensign's commission in the 22d Foot when only in his twelfth year, and within four months was gazetted lieutenant. His first service was during the rebellion in Ireland, where he was aide-de-camp to Sir James Duff. Having become captain in 1803, and exchanged into the 50th, he accompanied his regiment to the Peninsula, and distinguished himself at Coruña, where he had the rank of major, and where, after receiving five wounds, he was taken prisoner. In 1811, when again at liberty, he returned to the Peninsula, and fought at Busaco, where he had his jaw broken by a musket-ball. After obtaining the rank of colonel, and taking part in most of the leading events of the Peninsular campaigns, he returned to England on the conclusion of the peace. Having proceeded to America during the short war with the United States, he missed the battle of Waterloo, which took place three days before he reached the scene of action. On the peace a period of inactivity ensued, varied only by his appointment as governor of the island of Cephalonia, where he pleased the inhabitants better than the authorities at home; and by a short command of the military district of the north of England. A new and more important sphere opened to him, when, with the rank of major-general, which he had previously attained, he sailed for the East to assume the chief command within the presidency of Bombay. He arrived in 1841, and was shortly afterwards called to Scinde, in consequence of the determination of Lord Ellenborough, then governor-general, to punish the Ameers or rulers of that country for alleged misconduct during the Afghan war. Whatever may be thought of the justice of this policy, there can be no doubt as to the ability with which it was carried out by Charles Napier, first by the splendid victories of Meanee and Hyderabad, and afterwards by the administration of Scinde as a conquered province, of which Lord Ellenborough, by an unusual stretch of power, had made him governor. Partly in consequence of this appointment, and partly from identity of sentiment, major-general, now Sir Charles Napier, considered himself so bound up with his lordship, that when the latter was suddenly recalled by an unusual act of authority on the part of the court of directors, he considered his own position as governor of Scinde no longer tenable, and therefore resigned it as soon as he had been furnished with a plausible pretext by the failing health of Lady Napier. As the dissatisfaction between him and the directors was certainly mutual, and had received free utterance on both sides, nothing was less probable than that he should ever again serve under them. And yet it was so. During a panic caused by the want of anticipated success in the war with the Sikhs, the call for Sir Charles Napier as the man best qualified to bring it to a successful termination became so loud and general that the directors were unable to resist it, and in 1849 he sailed once more for the East, no longer as commander of the troops belonging to a single presidency, but as commander-in-chief of all the forces in India. Before he arrived, Lord Gough had brought the Sikh war to a triumphant termination, and nothing remained for Sir Charles Napier but to perform the duties of commander-in-chief under ordinary circumstances. While thus engaged he took a step which subjected him to an unceremonious rebuke from the Marquis of Dalhousie, the governor-general. He fired at it, and after a defence which even the Duke of Wellington, who had always stood his friend, pointedly condemned, he threw up his appointment and returned to England. His active career was terminated, and after a short period he died, 29th August, 1853, at his seat of Oaklands, near Portsmouth.

NAPIER, VICE-ADMIRAL SIR CHARLES, a distinguished naval commander, cousin of Sir Charles James and Sir William Napier, was the son of the Hon. Captain Charles Napier, R.N., and born at Merchiston Hall, Stirlingshire, on 6th March, 1786. At the age of thirteen he entered the navy as a volunteer on board the *Martin* sloop of war, served in the expedition to Ferrol, in the Mediterranean, and in the West Indies, and in 1805 was promoted to the rank of lieutenant. The following year he took part on board the *Courageux* in the capture of the *Marengo* and *La Belle Poule*. In 1807 he became commander of the *Pultusk* brig, from which he was shortly afterwards transferred to the *Recruit*, and in that capacity fought, on 8th September, 1808, a hard battle with the *Diligente*, in which he sustained a fractured thigh that made him halt for life. Next year he gained great fame at the capture of Martinique, and from the gallantry displayed by him in 1809 in the pursuit of three French line-of-battle ships, one of which, the *D'Hautpoult*, was ultimately captured and added to the British navy under the name of the *Abercromby*, he was appointed to the command of this vessel, and shortly afterwards

made prisoners. Relieved from active service he was appointed to the command of the British army in Portugal, but on the [illegible] were severely wounded and he himself received an injury. On recovering he was appointed to the command of the [illegible] and in the autumn of 1808 he was entrusted with the command of the naval force employed in the Baltic. He was afterwards transferred to the [illegible] and in 1809 proceeded to Admiral Keith's fleet off the Texel to assist in the operations of the Walcheren expedition. At the conclusion of the war he received the [illegible] of the Bath. He then settled for a time at Paris and [illegible] the first ambassador to the Sublime Porte. In 1815 Captain Napier returned to England and in 1816 received the command of the [illegible] on the coast of Portugal and the Azores. He there became involved in the Duke of Terceira and other leading political events, and on the overthrow of their faction and the restoration of the Miguelites to power, engagements effected the relief of Oporto and the establishment of Donna Maria on the throne. He was then appointed commander-in-chief in the Mediterranean, with a squadron of six sail of the line and the grand cross of the Tower and Sword conferred upon him. Shortly after his arrival on the station he set himself to the reform of the Portuguese navy, but was unfortunately thwarted and he threw up his appointment and returned to England. In 1832 he was appointed to the command of the *Powerful*, and proceeded to the Mediterranean, where, in the capacity of the mediator between Mehemet Ali and the Porte, and the representative of England with Russia and Austria on behalf of the latter power, Sir Charles Napier performed some of the most brilliant exploits in the history of Spain and the overthrow of Acre. Having blockaded Admiral Lindsay in the harbour of Alexandria, he compelled Mehemet Ali to enter into a convention with the Sultan, by which the latter and his family were guaranteed the hereditary sovereignty of Egypt, in exchange for all claim to Syria. The treaty was first signed at sea by the British government, but the wish of Sir Charles that Mehemet Ali should personally be recognised and an arrangement identical with his was published with the treaty. On his return to England he was created K.C.B. In 1841 he was elected member for Marylebone, and proved himself a warm advocate of liberal measures and naval reform. In 1847 he received the command of the Channel Fleet, and cruising as far as the Straits of Gibraltar, compelled the Emperor of Morocco to grant compensation for the injuries inflicted by him on British commerce. He returned to England in 1848. On the commencement of the Russian war he was nominated to the command of the Baltic fleet. In this capacity, with the exception of the capture of Bomarsund, he had few opportunities for striking a decisive blow, which at the time somewhat disappointed the country. The following spring (1855) he was superseded in the command by Sir Richard Dundas, who returned from the Baltic with still fewer laurels than Sir Charles. The latter repeatedly demanded an inquiry into his conduct, and having been returned in November, 1855, member for Southwark, urged his claims with great earnestness in Parliament, and also gave such a satisfactory account of his proceedings as silenced all cavils. To the last he continued to take an active interest in public matters, but was ultimately carried off by an attack of dysentery, 6th November, 1860. Besides his acknowledged professional abilities, Sir Charles Napier possessed literary talents of no mean order, and is the author of a series of Letters to Lord Melville on the State of the Navy, published in 1819; an account of the War in Portugal, and of the War in Syria, and numerous contributions to the United Service Magazine.

NAPIER, JOHN, Laird of Merchiston, near Edinburgh, the distinguished inventor of logarithms, was born in the year 1550. He was descended from an ancient race of land proprietors in Stirlingshire and Fifeshire. His father Sir Alexander Napier of Edinbellie, in the former county, and Merchiston, in the county of Edinburgh, was master of the mint to James VI. Napier was educated at St. Salvator's College, in the University of St. Andrews, which he entered in 1562. He afterwards travelled on the Continent probably to improve himself by intercourse with learned and scientific men. Nothing farther is ascertained respecting him, till after he had reached the fortieth year of his age. He is then found settled at the family seats of Merchiston, near Edinburgh, and Gartness, in Stirlingshire, where he seems to have practised the life of a recluse student, without the least desire to mingle actively in political affairs. That his mind was alive, however, to the civil and religious interests of his country, is proved by his publishing, in 1593, an exposition of the Revelation in the dedication of which to the king he urged his majesty in very plain language to attend better than he did to the enforcement of the laws, and the protection of religion, beginning reformation in his own 'house, family, and court.' In 1596 he is found suggesting the use of salt in improving land, an idea probably passed over in his own time as chimerical, but revived in the present age with good effect. No more is heard of him until 1614, when he astonished the world by the publication of his book of 'Logarithmorum Canonis Descriptio: Edinburgh, 4to.' He is understood to have devoted the intermediate time to the study of astronomy, a science then reviving to a new life, under the auspices of Kepler and Galileo, the former of whom dedicated his Ephemerides to Napier, considering him as the greatest man of his age in the particular department to which he applied his abilities. The invention was very soon known over all Europe, and was everywhere hailed with admiration by men of science. Napier followed it up, in 1617, by publishing a small treatise, giving an account of a method of performing the operations of multiplication and division by means of a number of small rods. These materials for calculation maintained for many years a place in science, and are known by the appellation of Napier's Bones. In 1608 Napier succeeded his father, when he had a contest with his brothers and sisters, on account of some settlements made to his prejudice by his father, in breach of a promise made in 1586, in presence of some friends of the family, not to sell, wadset, or dispose, from his son John, the lands of Over Merchiston, or any part thereof. The family disputes were probably accommodated before June 9, 1613, on which day John Napier was served and returned heir of his father in the lands of Over Merchiston. He did not long enjoy the inheritance which had fallen to him so unusually late in life. He died April 3, 1617, at Merchiston Castle, and was buried in the church of St. Giles, on the eastern side of its southern entrance. Napier was twice married. His eldest son, Archibald, who succeeded him, was raised to the rank of a baron by Charles I. in 1627, under the title of Lord Napier, which is still borne by his descendants. Among the members of this family are many distinguished names, such as those of Admiral Sir Charles Napier and General Sir Charles James Napier. A life of Napier by the Earl of Buchan was published in 1787, and another by Mr. Mark Napier in 1834.

NAPIER, Sir William Francis Patrick, a distinguished officer, brother of Sir Charles James Napier, the conqueror of Scinde, was born in the vicinity of Dublin on 17th December, 1785. At the age of fourteen he entered the army, served at the siege of Copenhagen, and with his brothers Charles and George took a distinguished part in the Peninsular campaigns, being severely wounded at the defence of the bridge of Almeida, and receiving no less than seven decorations for the share borne by him in as many principal actions, including Busaco, Salamanca, the Nivelle, and Orthez. Some years after the conclusion of peace he commenced his celebrated History of the Peninsular War, the publication of which began in 1828, and extended over the intermediate period till 1840, comprising six volumes. It will ever stand as a monument to his fame as a military historian, and furnishes the best and most interesting record existing of the momentous transactions which it chronicles, though from its opposition to the prevailing politics of the day its merits were at first insufficiently appreciated. In 1841 Colonel Napier was advanced to the rank of major-general, was appointed lieutenant-governor of Guernsey the following year, and in 1848 created a K.C.B. The animadversions on his brother's proceedings in India called him forth as a champion on his behalf, and he produced successively the Conquest of Scinde, History of Sir Charles Napier's Administration of Scinde, and Life and Opinions of the Late Sir Charles Napier. Sir William Napier died at Scinde House, Clapham, 12th February, 1860. He married in 1812 Miss Fox, niece of the celebrated statesman, who acted as a valuable assistant to him in his literary labours, and survived him only six weeks.

NAPLES, formerly a separate European state, but since 1860 incorporated with the Kingdom of Italy. It formed a political and administrative division of the Kingdom of the Two Sicilies, comprising the continental portion of that state. It occupied the southern part of the Italian Peninsula, being bounded on the north by the (former) Pontifical States and Terra di Lavoro; on the east by the Adriatic, on the south and west by the Mediterranean. The coasts are high and bold, especially on the west coast, and deeply indented. The interior may be generally characterized as mountainous, being traversed by the Apennines, which proceed through it first in a south-easterly direction, and then run south till they reach its extremity near the Strait of Messina, at the same time throwing off numerous branches, which intersect the country in all directions. Several of the loftiest summits of the Apennines are situated in Naples: Monte Corno, or Gran Sasso d'Italia, the culminating point of the whole range, is 9541 feet; Majella, 9131 feet; and Mount Velino, 8174 feet. Between even the highest ridges, however, valleys, generally narrow, but often of great length, intervene. Amongst the lower ramifications, where the hills assume rounded forms, large undulating tracts, equally distinguished by beauty and fertility, are found; and towards the coast, both on its east and west side, the hills disappear, and are succeeded by extensive plains. The chief isolated mountains are the volcano of Vesuvius and Mount Gargano, near the Adriatic. The rivers are numerous; they generally take their rise in the Apeninnes at no great distance from the coast, and are therefore of small size. The principal are the Vomano, Pescaro, Sangro, Trigno, Biferno, Fortore, Candelaro, Cervaro, Carapella, and the Ofanto, flowing into the Adriatic; and the Garigliano, Volturno, Sele, Basento, and Bredano, flowing into the Mediterranean. The only large lake (Fucino) was drained in 1862. The soil is volcanic and subject to earthquakes; in 1857 forty towns and villages were destroyed in the central provinces, and over 10,000 lives lost in this way. The climate is divided into three regions; in the lower region the temperature is so mild that vegetation is never interrupted; in the middle region snow occasionally falls, but does not usually lie long; in the upper regions of the Abruzzi cold is sometimes severe and protracted; snow lies on Mount Corno nine months in the year. Naples is unhealthy in the marshy districts and during the prevalence of the sirocco, from July to September, when the heat is excessive. The flora has, in addition to the plants common to Italy, several tropical products, including cotton, the sugar-cane, pistachio, and dates. The wolf, wild-boar, porcupine, and game of all kinds abound in the forests; and the coasts have always been celebrated for fish, on which the tunny, anchovy, mullet, oyster, and coral fisheries employ many of the inhabitants. Domestic animals comprise sheep, goats, and pigs; cattle are not numerous; horses are of a small but active breed; asses and mules are the principal beasts of burden; buffaloes are pastured in herds on the marshes; sheep are extensively reared in the plains of Capitanata; herds of goats are kept on the mountains; and hogs, almost in a wild state, are left to seek their food in the forests. Agriculture, which is still in a backward state, forms the occupation of the bulk of the population. Wheat, barley, maize, and rye are the principal crops, and on the finer soils are remarkable both for abundance and quality; rice is frequently grown on the lower flats. The mulberry and the olive are extensively cultivated, and yield silk and oil in such quantities as to form important articles of export. Cotton, lint, hemp, liquorice, and tobacco are leading crops in some districts, and many varieties of fruit, especially figs, lemons, and oranges, are very abundant. The wines of this region are the best in Italy. The celebrated Lacrima Cristi, a red wine, is grown in vineyards on the slopes of Vesuvius. The minerals have not been properly explored; there are few indications of metals, but beds of rock-salt are found, chiefly in Calabria; sulphur in the volcanic region, and alum and saltpetre in several districts. The quarries furnish excellent marble and lava, which are extensively used both for building and pavement. Manufactures are numerous but unimportant; the chief are silks, linens, and woollens at Naples, Soro, and Isola; and glass, cutlery, and paper to a small extent. Commerce is mostly confined to the capital. The chief exports are silk, hemp, wool, olive-oil, wine, grain, macaroni, and coral; imports, colonial and manufactured goods, iron, and cutlery. Monasteries and nunneries were formerly very numerous, but under the new *régime* many have been suppressed. Public instruction was entirely in the hands of the priests, and all classes were deplorably ignorant, nor is education much advanced yet.

History.—Continental Naples corresponds nearly in its northern part to Campania and Samnium, and in its southern part to Apulia, Lucania, Messapia, and the territory of the Bruttii. The last four were often comprehended under the name of Magna Græcia, given to them because long occupied, if not originally peopled, by colonies from Greece. The frugal lives and independent and warlike spirit of the natives have been celebrated by classic historians and poets; but their resistance to Rome proved ineffectual, and shortly after the defeat of Pyrrhus they were annexed to the Roman Republic, and long formed one of its most valuable portions. On the breaking up of the Roman Empire the country was overrun by hordes of barbarians, and passed successively under the domination of Goths, Lombards, Arabs, and Normans. In more modern times, also, it has been subjected to

numerous vicissitudes. In the early part of the sixteenth century it came into the possession of Spain, which retained it for nearly two centuries, and governed it by viceroys. In 1734 it was erected into an independent monarchy in favour of the Infante Don Carlos, or, as he is sometimes called, Charles of Bourbon. His reign was not without vigour, and much good was done; but on his accession to the throne of Spain in 1759 he was succeeded by his son Ferdinand IV., then only in his eighth year. A regency was accordingly established, and the nation experienced all the evils of a long minority. The king himself, indeed, even after he became major, showed little inclination to exercise his rights; and the Marchese Tanucci, who had long been at the head of the regency, continued virtually sovereign. Ferdinand, though not devoid of natural talents, gave himself up to the pleasures of the table and the chase, pursuing a course which, to say the least of it, was very unkingly. His queen was animated by a very different spirit; and having succeeded in obtaining Tanucci's dismissal, took the reins into her own hand, and managed them with great talent, though too often in a capricious, tyrannical, and vindictive spirit. The French revolution now broke out, and extending its influence in all directions, ultimately established its ascendency even in Naples. The king, who had at first shown symptoms of reviving spirit, soon relapsed into pusillanimity, and fled across the straits, leaving his Neapolitan subjects to their fate. Strange to say, the strongest resistance which the enemy experienced proceeded from a quarter where it might least have been expected. When the court and the greater part of the nobility had fled, and the great body of the upper and middle classes were either treacherous or cowardly, the lazzaroni of Naples, composed of the very dregs of society, homeless wretches who could neither gain nor lose by political changes, raised the patriotic standard, and fought like heroes, or rather demons; for, as may be supposed, the atrocities of the warfare were hideous. Napoleon ultimately succeeded in placing first his brother Joseph, and on Joseph's removal to Spain, his brother-in-law Murat, on the throne of Naples. During Napoleon's reverses Murat sought to secure his crown by abandoning him, but by subsequent proceedings forfeited both the crown and his life. Ferdinand regained his throne, and made many liberal promises which were not fulfilled. His successor Francis II. continued the abuses of the old regime. The discontent of his subjects broke out in 1860, on the arrival of Garibaldi, in universal rebellion. The king was deposed, and Naples declared part of the Kingdom of Italy, December 17, 1860.

NAPLES (Italian, *Napoli*), a city in Italy, formerly capital of the kingdom and province of same name, on the west coast of Italy, 117 miles south-east of Rome, magnificently situated on the north side of a nearly semicircular bay, partly stretching along the shore and partly climbing the adjacent heights, bounded on the west by the picturesque heights of Posilipo, and on the east by the lofty tops of Vesuvius, while the surrounding country, rich in natural beauty, derives additional attractions from the numerous villas and other objects with which human art has embellished it. The best distant view of Naples is obtained in approaching it from the sea, and on passing the beautiful islands which guard the entrance to its bay. A favourite and most picturesque view is obtained from the Vomero, a rising ground, covered with fine villas, to the west of the city; the fort of St. Elmo comes into the fore-ground on the left; the city and the bay, studded with sails, form the centre of the picture, while the vista is terminated by the smoking crater of Vesuvius. Naples is neither surrounded by walls nor regularly fortified, but is protected by three forts or castles—St. Elmo, the largest of the three, occupying a hill on the north-west side, and containing excavations and other works hewn out of the rock; Castello Nuovo, almost close to the sea; and Castello dell' Ovo, on a rocky islet, connected by a jetty with the land. Immediately adjoining is a large arsenal and cannon foundry, which has the appearance of a fortification, being flanked with bastions. The great mass of buildings of which the city consists forms an irregular oblong, the greatest length of which, from north to south, is 3 miles; the breadth, from east to west, about 1½ mile; and the circuit, nearly 8 miles. By including the suburbs, which encroach so closely upon the town that they can hardly be distinguished from it, this circuit will be nearly doubled. Of the gates, some of which are now near the centre of the city, that of Capua, with reliefs by Benedetto da Majano, is the only one deserving of notice. The streets are tolerably regular, generally clean, and admirably paved with square blocks of lava, so exactly fitted that not the least inequality can be discerned; but are for the most part narrow in fact, and still narrower in appearance, both from the number of booths and other obstructions which are allowed to encumber them, and from the general construction of the houses. These are large, substantial, and lofty, averaging not less than five or six stories. The roofs are flat, and by the number of plants crowded upon them, converted into a kind of domestic shrubberies, to which the inmates often resort to enjoy the breeze. Though generally displaying little architectural taste, the houses are abundantly provided with balconies and other projections, crowded, like the roofs, with plants and shrubs, and attended with the worse effect of excluding both light and air. The best street is that of Toledo, which, opening from the market-place on the north extremity of the city, traverses it centrically throughout its whole length, and terminates at the palace not far from the shore. It forms the principal thoroughfare, but, both in its buildings and its shops, is far inferior to the leading streets of most other European capitals. The squares are numerous, though generally of small dimensions, irregular in form, and lined by buildings in which uniformity of design appears to have been altogether forgotten. The largest and most handsome are the Largo di Palazzo, chiefly occupied by the palace which gives it its name, and a large modern church, intended to imitate that of St. Peter at Rome; the Largo di Castello, planted with trees; and the Piazza di Mercato or market-place. Many fountains, well supplied with excellent water, and often ambitiously but not very tastefully ornamented, are scattered over the different quarters of the city; and fine promenades are furnished by several of the quays along the shore. Among others may be mentioned those of Santa Lucia and Spiaggia di Chiaia. The latter, which is of great length, is adorned with numerous marble statues, and in fine evenings is crowded with equipages, often of an elegant, and often also of a very grotesque description; every Neapolitan who can muster any sort of conveyance disdaining to appear on foot. The public edifices are not very remarkable, and suffer much in the estimation of strangers who have come from the north of the peninsula, from being contrasted with much more noble structures. The most deserving of notice are the cathedral, a large Gothic building, erected on the site of two temples dedicated to Neptune and Apollo, from the ruins of which it probably derived its numerous granite pillars and ancient marbles. The present building dates from 1272, and is held in

high veneration, in consequence of possessing the relics of St. Januarius or Gennaro; among others, the phial of his blood, which is miraculously liquefied on certain occasions; the church De' Santi Apostoli, said to have been originally founded by Constantine the Great on the site of a temple of Mercury, and, though subsequently rebuilt, still very ancient; the church of St. Paul, a handsome edifice, internally faced with marble; the churches of Sta. Chiara, St. Martin, Del Parto, San Severo, St. Philip de Neri, and other churches, to the number in all of nearly 200, several of them of architectural merit, and almost all of them richly decorated; the Palazzo Reale (Royal Palace), an immense building of three stories, each of a different order of architecture, only partially completed according to the original design, but richly fitted up, and adorned with good paintings; the palace of Capo di Monte, situated in the north, outside the town, on an eminence of that name, and formerly the usual summer residence of the king, commanding magnificent views, adorned with fine sculptures, paintings, and articles of vertu, belonging to the celebrated Farnese gallery, and surrounded by beautiful gardens; the old palace, where the courts of justice now hold their sittings; the Palazzo dei Pubblici Studj, originally built for the university, and occupied by it till 1790, but now converted into the Museo Nazionale, a museum of which any nation might be proud, containing not only a valuable library of 275,000 volumes, and many rare MSS., but an unequalled collection of gems, bronzes, vases, &c., chiefly obtained from the excavations of Pompeii and Herculaneum; seven theatres, of which that of San Carlo is remarkable for its magnificence, and is one of the largest in existence. The principal educational establishments are the university, which, since its removal from the Palazzo degli Studj, occupies the buildings of an old convent, and is attended by several thousand students; the royal lyceum, Chinese College, the military, navigation, veterinary, musical conservatory, medical, and other schools, male and female. Among literary and scientific institutions are a royal society of arts, science, and antiquities, an observatory, a botanical garden, an agricultural society, and physical, chemical, and mineralogical cabinets. The benevolent endowments include several large hospitals, particularly the Degl' Incurabili, and Della Annunziata, the latter partly for foundlings; the Reclusoria or Albergo dei Poveri, an orphan asylum or house of refuge, on a very extensive scale; a *monte-di-pietà*, and a deaf and dumb institute.

The manufactures are much more numerous than important. At the head of them stands that of maccaroni and vermicelli, constituting the principal food of the great body of the people. Next to it are silk stuffs, and especially Gros de Naples, which owes its name to the extent and superiority of its manufacture here. The other leading articles are firearms, porcelain, tobacco, castings, lace, gloves, soap, carriages, violins and other musical instruments, hats, woollen, linen, and cotton stuffs. Notwithstanding the large extent of the bay, the actual harbour is of small dimensions, consisting of a mole, which projects nearly from the centre of the city, and at which the water, though deep at its outer extremity, shallows so much near the town as to float only small vessels. A new port has been formed in the Island of Procida, in the Bay. In 1882 the total value of goods imported was £5,497,038; exports, £2,558,760. The exports consist chiefly of bones, cream of tartar, hoops, linseed, hemp, wheat, figs, gloves, liquorice, madder, coral, maccaroni, oil, wine, wool, tallow, rags, and silk, raw, dyed, and manufactured. The environs, apart from their surpassing beauty of scenery, are extremely interesting. The locality containing the tomb of Virgil, the excavated cities of Herculaneum and Pompeii, the remains of Roman temples, villas, palaces, and tombs, together with the physical phenomena of Vesuvius, possesses an inexhaustible source of interest to the scientific, antiquarian, and classical investigator. The modern villas are splendid and luxurious. One of the most peculiar features of the city is its unique population, and the universal publicity in which life is passed. The inhabitants swarm incessantly in the thoroughfares, where throngs of sellers, buyers, and idlers intermingle with asses, mules, hand-carts, and vehicles, dazzling the eye with their brilliant variety of costume, and the expressiveness of their frantic gestures and attitudes, while the ear is stunned by the shrill cries of the itinerant dealers, the songs of the improvisatore, and the high-pitched patois of the seething crowds. The Marinella, a long open beach beyond the Castello del Carmine, was formerly the abode of the lazzaroni, a class which has now lost its distinctive features; and the term is now generally applied to the fishermen.

Naples, at first called *Parthenope*, because the siren of that name was fabled to have been buried here, is of very ancient date, and was founded by a colony of Greeks who had settled at Cumæ. It afterwards took the name of Neapolis (New City), and is said to have retained strong traces of its Grecian origin to a late period of the Roman Empire. It was indebted to the emperors Hadrian and Constantine the Great for numerous embellishments, and became a luxurious retreat, to which many of the wealthier Romans were accustomed to resort. In 536 it was pillaged by Belisarius, and a few years after, when it had been rebuilt, the same disaster again befell it at the hands of Totila (543). It was afterwards successively under the sway of the Normans, the emperors of Germany, and the kings of France and Spain. Under the latter it became the capital of an independent kingdom, but having been brought within the vortex of the French revolution, was handed over by Napoleon, first to his brother Joseph, and then to his brother-in-law Murat. The Congress of Vienna having restored the legitimate sovereignty, Naples received its former masters. After a long period of misrule they were ejected by Garibaldi in 1860, and the whole of their dominions were then incorporated into the Kingdom of Italy. Pop. (Dec. 31, 1881), 463,172.

NAPLES, BAY OF (anciently, *Crater Sinus*), an indentation on the west coast of Naples, in the Mediterranean, having at its entrance between Cape Misenum on the north-west, and Cape Campanella on the south-east, a width of about 20 miles, and penetrating into the coast for nearly the same distance. At its north entrance are the islands of Ischia and Procida, and at its south entrance the Island of Capri; within, on its north shore, the city of Naples rises like an amphitheatre; while on the east the view is terminated still more magnificently by Mount Vesuvius. Both ancient and modern writers celebrate the beauty and grandeur of its scenery.

NAPLES YELLOW. This name is applied to antimonate of lead which is used in oil painting; it is prepared by exposing a mixture of 2 parts pure lead nitrate, 1 part pure tartar-emetic, and 4 parts pure sodium chloride for two hours to a heat sufficient to fuse the sodium chloride, and treating the fused mass with water. This is a pigment of some celebrity, and was formerly prepared at Naples under the name of *grallolina*. It was supposed to have been a native production of Vesuvius and other volcanoes. It is not such a vivid colour as patent yellow and turbith mineral, but is of a warm golden tint. Like most

yellows it is opaque. It is not changed by the light of the sun, and may be used safely in oil or varnish, but is likely to blacken by damp or impure air when used as a water-colour, or when not protected by oil and varnish.

NAPOLÉON BONAPARTE, Emperor of the French, was born 15th August, 1769, at Ajaccio, capital of the island of Corsica, and was the son of Charles Marie Bonaparte, an advocate of considerable reputation, and of Letizia Ramolino, a woman of rare intelligence and personal charms. (See BONAPARTE.) In his tenth year he was sent to the military school of Brienne, where he remained until 1784. The celebrated Pichegru was one of his teachers. His school companions regarded him as taciturn and morose; but as he was a Corsican, speaking very little French, and poor as well as proud, his conduct is doubtless to be ascribed as much to his circumstances as to his temperament. Towards those who, like Bourrienne, showed him sympathy, he was susceptible of strong and lasting attachments. We learn from the annual report of the school that he 'distinguished himself in mathematics, was tolerably versed in history and geography, weak in Latin, general literature, and other accomplishments; of regular habits, well behaved and studious, and enjoying excellent health.' His favourite author was Plutarch, whose romantic biographies are so captivating to the imagination of youth. In October, 1784, he repaired to the military school at Paris to complete his studies for the army; and in September, 1785, received his commission of second lieutenant in the artillery regiment of La Fère. Soon afterwards he was promoted to be first lieutenant in the regiment of Grenoble, then stationed at Valence. While here he devoted some attention to literature, gaining the prize offered by the Lyons Academy for an essay, What are the Principles and the Institutions necessary to make Men Happy? He had the intention of describing an excursion he made to Mount Cenis in the style of Sterne's Sentimental Journey, then much in vogue on the Continent. A much more suitable task was a History of Corsica, which he began and communicated to Paoli, then living in exile in London. Meantime the revolution was rapidly developing itself. Many of Napoléon's fellow-officers at Valence openly took part with the royalists; he, however, took the popular side, but in a quiet and undemonstrative way, as he had scant liking for the loud enthusiasm of ungovernable mobs. On 6th February, 1792, he became captain of artillery by seniority, and being in Paris the same year he witnessed the insurrections of the 20th June and of the 10th August. He was accompanied by his friend and biographer Bourrienne, who relates that on one of these occasions, when Napoléon saw the mob break into the Tuileries, and force the king to don the red cap, he exclaimed, 'It is all over with that poor man! A few discharges of grape would have sent all those despicable wretches fleeing!' Soon after he left for Corsica, where General Paoli now held the chief command. The excesses of the Septembrists and Terrorists, however, induced Paoli to break with the Convention and seek the assistance of England. This brought him into conflict with Napoléon, who adhered to the Convention, which so exasperated the Corsicans against him that after a few skirmishes he was driven from the island along with his whole family. He made a short stay at Marseilles, where he published a small pamphlet, Le Souper de Beaucaire, republican in sentiment it is true, but not Jacobinical, as has been asserted; he then set out for Paris, where he spent a part of the summer of 1793; and in the September of that year he was sent, with the commission of lieutenant-colonel of artillery, to assist in the reduction of Toulon, then in the hands of the English. The place was captured (19th December) entirely through his strategic genius; and in the following February he was made a brigadier-general of artillery. Later in the year he was sent to Genoa to examine the state of the defences of that city, and to ascertain the political disposition of its inhabitants. In the beginning of 1795 he was again in Paris in search of employment, but in spite of his known abilities he was not at first successful. In his letters to his brother Joseph, written about this time, he complains of poverty and ennui, and seems to have thought of offering his services to the Sultan of Turkey. On the 13th Vendémiaire IV. (4th October, 1795), when the sections of Paris rose against the Convention, Napoléon was made commander of the 5000 troops provided for its defence, on the suggestion of Barras. He had only a night to make arrangements for the dispersion of the populace. On the morning of the 5th, when the national guards, as the defenders of the sections were called, advanced to the number of 30,000 along the quays of the Seine, the Rue St. Honoré, and the other approaches to the Tuileries, they found every point securely guarded. To their feeble musketry fire Napoléon replied by murderous discharges of grape. In less than an hour of actual fighting victory was secured for the Convention, which recognized the value of the young victor's services by appointing him to the command of the army of the interior. About this time he made the acquaintance of the graceful, amiable, and accomplished Joséphine Beauharnais (see JOSÉPHINE), who made such an impression on him that he proposed marriage to her, and was accepted. The ceremony took place 9th March, 1796, and in less than a week after he had to depart to assume the command of the army of Italy, which for three or four years had been carrying on a desultory warfare against the Sardinians and the Austrians amidst the defiles of the Alps and the Ligurian Apennines. His army consisted of only 40,000 men, and even those were badly fed and clothed, while the allies could oppose him with a well-appointed force of about double that number. In the end of March he set out from Nice and came up with the allies at Montenotte, and inflicted upon them a crushing defeat (11th April). This victory separated the Sardinian from the Austrian army, and Napoléon, determined to crush them in detail, pursued the former and beat them at Millesimo (13th and 14th), and then fell upon the latter at Dego (14th and 15th). This opened up for him both the route to Turin and to Milan. Napoléon lost no time; the Sardinians, who were retiring upon Turin, were overtaken and crushed at Mondovi (22d), which compelled them to sue for peace; and the Austrians, who were falling back on Milan, were signally defeated at the battle of Lodi (10th May). On the 15th he entered Milan, where heavy contributions were levied upon the state, and the principal works of art were seized and sent to Paris. Naples, Modena, and Parma hastened to conclude a peace; the pope was compelled to sign an armistice; and the whole of Northern Italy was in the hands of the French. Mantua was the next object of attack. Wurmser, at the head of large Austrian reinforcements, advanced through the Tyrol to its defence; he was defeated at Castiglione 5th August, and again at Bassano, 8th September, which compelled him to take refuge behind the walls of Mantua. Not yet disheartened, Austria sent a third army in two divisions under Marshal Alvinczy and General Davidovich. This for a while held the French in check; but on the 15th November a battle was fought at Arcole, which, after three days of hard

fighting, gave the victory again to the French, and decided the result of the campaign. In January, 1797, Alvinczy opened a fresh campaign by advancing at the head of 50,000 troops from Roveredo to the relief of Mantua, but was completely routed by Napoléon on the 14th at Rivoli; and on the 2d February Wurmser was compelled by famine to surrender at Mantua. On the same day Napoléon put an end to his armistice with the pope, and invaded the States of the Church, beat the Papal troops on the Senio, and took in quick succession the towns of Faenza, Ancona, Loretto, and Tolentino. On the 19th the pope was compelled to conclude a peace, by which he surrendered Avignon, Bologna, Ferrara, and the Romagna to France. Meanwhile the Austrians were preparing for another descent upon Italy under the Archduke Charles, and Napoléon determined to anticipate them before they could be joined by reinforcements from the Rhine. He entered the Tyrol, driving the archduke before him, and had reached Judenberg, but a few days' march from Vienna, when an armistice was accepted (7th April), and preliminaries were signed on the 18th at Leoben, by which Austria gave up her territories in the Netherlands and Lombardy to France, and received in return the province of Venetia. This closed the great Italian campaigns, in which Napoléon, in ingenuity of plan, celerity of movement, and audacity in assault, far outshone all his antagonists. It is but fair to him to add, that while in the main he made little scruples in carrying out the rapacious orders of the Directory, he does not appear to have appropriated anything to himself.

In December, 1797, Napoléon returned to Paris; the enthusiasm of the Parisians was immense, and the festivals in his honour innumerable. About this time the Directory seems to have had the intention of invading England, and had brought an army together for that purpose. The command was conferred upon Napoléon, who at first professed to favour the design, but who well knew its impracticability. It has been thought by many that this proposal was merely a feint to cover the real design of the Directory, namely, the invasion of Egypt, as a preliminary step to the conquest of British India. By the 10th May an army of 36,000 men was collected and embarked at Toulon in a fleet commanded by Brueys. A body of scientific and artistic explorers accompanied it. On 9th June the French landed at Malta, and the next day took possession of the island, in which they left a garrison. Ten days after the fleet resumed its voyage, reaching Alexandria on the 1st July, which being taken Napoléon and the army advanced on Cairo. Here they were encountered by a large body of Mamelukes, under Mourad Bey, which, after a long and sanguinary struggle, known as the battle of the Pyramids, was repulsed. Many of the surrounding tribes thereupon submitted to the French, who thus for a while held a seeming possession of the whole of Egypt. Thinking himself secure of his conquest Napoléon immediately set about reorganizing the civil and military organization of the country; but fortune was preparing for him a terrible reverse. The English admiral Nelson, who had been long in pursuit of his fleet, found it moored in the Bay of Aboukir, and, with the exception of four vessels which contrived to escape, utterly destroyed it. All means of return to Europe for the French were thus cut off, and to add to their misfortunes the sultan declared war against them, and a short time after serious disturbances broke out in Cairo which were only suppressed by horrible massacres. Napoléon resolved to meet the Turkish forces assembling in Syria. In February, 1799, he crossed the desert with about 13,000 men; took El Arish and Gaza, and stormed Jaffa, where a great number of Turkish prisoners were deliberately massacred. On the 17th he reached Acre, which was defended by a Turkish garrison under Djezzar Pasha, assisted by Sir Sydney Smith and a small body of English sailors and marines. After sixty days' siege he was compelled to relinquish the attempt to capture this place, and return to Egypt, leaving the whole country on fire behind him. He re-entered Cairo on the 14th June, having lost 4000 men in the Syrian expedition. About the middle of July the sultan landed a force of 18,000 at Aboukir, which Napoléon attacked and almost annihilated on the 25th. His position was far from agreeable, however; he had signally failed in the great objects of his expedition, and besides news had reached him of disaster to the French arms in Italy and confusion in Paris. On the 22d August he abandoned the command of the army to Kléber, and embarking in a frigate landed at Fréjus, 9th October, narrowly escaping capture several times by the British Mediterranean cruisers. He arrived in Paris in time to take advantage of the political intrigues then rife. The credit of the government was wholly gone, and it was ill-obeyed by its generals. A revolution had taken place in the government on the 18th June, but the new directors were as incompetent as the old. Another change became necessary. Napoléon secured the co-operation of Moreau and the other generals then in the capital, and abolished the Directory on the 18th and 19th Brumaire (9th–10th November). A new constitution was then drawn up chiefly by the Abbé Siéyès, under which Napoléon was made first consul, with Cambacérès and Lebrun as second and third consuls. As, however, he had the power of appointing to all public offices, of proposing all public measures in peace and in war, and the entire command of all administrative affairs, both civil and military, he was virtually ruler of France.

From this time Napoléon's policy developed itself more distinctly; its objects were to establish order at home and to humiliate the enemies of the nation; but unfortunately personal aggrandizement was an end scarcely less conspicuous. In the same summary manner in which he ordered his troops, with equal sagacity, activity, and boldness he undertook to reform civil affairs. He recruited the national treasury by various sagacious expedients, repealed the more violent laws passed during the revolution, such as punishment for matters of opinion, reopened the churches, and suppressed the Vendean insurrection by a series of decided but conciliatory measures. But he was well aware that his genius was essentially military, and that his most striking triumphs were those won on the battle-field. He offered Austria, England, and Turkey, in theatrical phrases, terms of peace, which were rejected. He resolved to strike a blow first at Austria by a renewal of the glories of his former Italian campaign. An army of 36,000 men was concentrated with unparalleled rapidity and secrecy on the shores of the Lake of Geneva. On the 13th May, 1800, he began his daring march across the Great St. Bernard, and almost before the Austrian general Melas was aware, had entered Milan (2d June). After several unimportant skirmishes he encountered the Austrians at Marengo (14th June), where he achieved another brilliant victory, which put all the Piedmontese fortresses, and for the second time, in possession of the French. Having established provisional government at Milan, Turin, and Genoa, he returned to Paris on the 3d July. As his general, Moreau, had defeated the Archduke John in the decisive battle of Hohenlinden (3d December) Austria was reduced to sue for peace, and on the 9th February, 1801, signed the treaty of Lunéville, which was

and barracks. Namur is famous for its cutlery, its leather-works, and its iron and brass foundries. The trade is greatly favoured by the two navigable rivers. Steamers ply on the Meuse; and railways communicate with Brussels, Mons, and the French frontier. Namur dates from the seventh century, under the names of Namucum, Navinucum Castrum, and Namon. It was taken by Louis XIV. in 1692, and retaken by William III. of England in 1695. Its fortifications were demolished by Joseph II. of Austria in 1784, and restored in 1817. Pop. 25,766.

NANCHE, a town in China, province of Chekiang, in a beautiful valley, where the Hwuy-chow is joined by one of its affluents, 40 miles west of Yen-chow-foo. It is about 3 miles in circuit, is neat and clean, very much like an English town, and consists of houses, generally of two stories, ranged along the banks of the stream, which is covered with boats constantly plying to Yen-chow, Hang-chow, and many places both above and below. Pop. about 200,000.

NANCY, a town of France, capital of the department Meurthe-et-Moselle, finely situated in a fertile plain, near the left bank of the Meurthe, 177 miles east of Paris, on the railway to Strasburg. It is one of the prettiest towns in France. It is divided into the old and the new town. The former is for the most part irregularly built, with streets narrow and winding; but several of the buildings are elegant, and not a few of them compensate, by their antiquity, for the want of uniformity in their structure. The new town is remarkably elegant, with streets straight and spacious, intersecting each other at right angles, and the houses, almost without exception, handsome. The Place Royale or Stanislas, surrounded by six or seven fine public buildings, and communicating, by a triumphal arch, with the Place Carrière, has seldom been surpassed. The principal edifices are the cathedral, a modern structure in the Italian style; the church of St. Epvre, with a lofty tower and a fine portal; the church of the Cordeliers, built in 1484, and containing the tombs of several dukes of Lorraine; the ducal chapel, entered from the church of the Cordeliers, and built in the form of an octagonal mausoleum; the Hôtel de Ville, the university, royal college, theatre, barracks, museum, library, and several hospitals. In the Place Royale is a fine statue of Stanislas Leszczynski, king of Poland, who passed the latter years of his life here as Duke of Lorraine, and bestowed upon the town many of its finest modern embellishments. The Cours d'Orleans, occupying the highest part of the town, and finely planted, is the principal promenade. Nancy is the see of a bishop, possesses courts of first resort and commerce, a consulting chamber of manufactures, an academy of sciences, a secondary school of medicine, a botanical garden, a school of design, a theological seminary, &c. The manufactures consist of broad-cloth and other woollen stuffs; hosiery, lace, all kinds of embroidery, stained paper, &c. There are also numerous cotton-mills, dye-works, and tanneries. The trade is in corn, wine, brandy, leather, wool, &c. The most memorable event in the annals of Nancy is the battle fought under its walls, when the Duke of Burgundy (Charles the Bold) was signally defeated and slain by René II., duke of Lorraine. On August 12, 1870, it surrendered to the Germans, by whom it was occupied until 1st August, 1873. Pop. in 1872, 52,978, in 1881, 73,225, the increase being chiefly due to the influx of Alsatians who preferred to retain their French nationality after the annexation of Alsace to Germany.

NANGASAKI. See NAGASAKI.

NANKEEN, or NANKIN, a sort of cotton cloth, which takes its name from the city of Nanking, where it was originally manufactured. It was formerly imported extensively from China, and was used for making ladies' corsets and gentlemen's trousers and vests, but in Britain, at least, it has been superseded by other fabrics. It is now imitated in most other countries where cotton goods are woven; but those of the East are superior, on account of the natural colour of the cotton (*Gossypium religiosum*) being brownish-yellow, while in those countries where white cotton is used it is necessary to give it the proper hue by artificial means. The English manufactures have now so completely driven the Chinese from the market, that large quantities are shipped from this country to Canton.

NANKING (officially, *Kiangning*, that is, Southern Capital), a celebrated city, China, capital of the province of Kiangsu, near the right bank of the Yang-tse-Kiang, 560 miles south by east of Peking. It is 18 miles in circumference, and is surrounded by a wall, generally above 40 feet high. The river opposite the city is 1½ mile broad, 25 fathoms deep, with a rocky bottom, and a current of 3 miles to 5 miles an hour. The city lies 3 miles south from the Yang-tse-Kiang, but a part of its walls approaches within 700 paces of the water. The principal streets are of moderate breadth, clean, well paved, and lined with handsome shops; but the houses are, in general, mean, and only one story high. The part of the city occupied by the Manchoos is separated by a cross wall from the Chinese town. The great extent of the wall renders the defence of the city difficult; besides which, it is overlooked from the hills on the east. On that side there are three gates; the land towards the river is marshy, and the gates are approached on stone causeways. A deep canal or ditch runs up from the river directly under the walls, on the west, serving to strengthen the approaches on that side. There are, in the city, extensive manufactories of fine satin and crape, and the cotton cloth which foreigners call Nankeen derives its name from this city; paper and ink of fine quality, and beautiful artificial flowers of pith paper, are produced here. Nanking is celebrated also for its scholars and literary character, as well as manufactures, having many large libraries and book stores. It is the residence of the governor-general of three provinces, and, consequently, the centre of a large concourse of officials, educated men, and students seeking for promotion.

Nanking was at one time the capital of the Chinese Empire; but when the seat of government was transferred to Peking, about the end of the thirteenth century, it lost its importance, and a great part of its population; about a third of its area being, it is supposed, now unoccupied. The ancient wall of the city can be traced for 35 miles, but all its ancient palaces have disappeared; and the only remarkable remains of royalty now extant are some sepulchral statues situated near the walls. The famous porcelain tower of 9 stories, and 200 feet in height, completed in 1432, and destroyed during the Taiping rebellion, is said to be now completely restored. It was at Nanking that the British compelled the Chinese to submit to their terms of peace in 1842. The city was held from the spring of 1853, to 19th July, 1864, by the Taipings, who made it their capital. At its capture by the rebels and recapture by the Imperialists it suffered severely. Pop. estimated at 400,000.

NANTES, a town of France, capital of the department of Loire-Inférieure, on the right bank of the Loire, where it receives both the Erdre and the Sèvre, 269 miles west-south-west of Paris, with which it is connected by railway. The Loire here forms a number of islands, two of which are among the finest quarters of the town; the communication between the different parts of which is kept up by at

least sixteen bridges. The situation, on an important navigable river, within 40 miles of the ocean, is advantageous for commerce; and the whole town is so well placed, and so regularly, and in some parts so splendidly built, that it justly ranks as one of the finest towns in France. It has a number of elegant squares; and its quays, which line the banks of the rivers, extend nearly 2 miles. The public edifices most deserving of notice are the cathedral, externally an unsightly pile, from the unfinished towers not rising much higher than the roof, but possessed of fine portals, richly sculptured, although the sculptures have unfortunately sustained considerable damage; the castle, an enormous mass of irregular buildings, flanked with round towers; the Hôtel de Ville, the exchange, the theatre, museum of natural history, picture gallery, old mint, now occupied by the courts of justice; public library, the chapter-house, and Hôtel Dieu or infirmary. Nantes is the see of a bishop, and possesses courts of first resort and commerce, a chamber of commerce and exchange, a college, diocesan seminary, and secondary ecclesiastical school; a secondary school of medicine, and a hydrographical school of the first class. The manufactures consist of woollen covers, serge, flannel, printed stuffs, canvas, varnished hats, marine cordage, chemical products, glue, ship biscuits, &c.; there are also cotton-mills, numerous sugar-refineries, and bleach-fields. The building-docks are of great extent, and fit out vessels from 1000 tons and under, which have long borne a high name for their sailing properties. Nantes is the fourth in importance of the French ports for the number of vessels employed, and the third for the amount of customs duties paid. The trade is greatly favoured, not merely by the river, but by a canal which communicates with Brest, and more recently by the railway which connects Paris with the west coast; it includes a great variety of articles both for the home, the colonial, and the foreign markets. Before the conquest of Gaul by the Romans, Nantes was the capital of the Nannetes. In 445 it valiantly withstood a siege of 60 days by the Huns. During the ninth century it was thrice taken by the Normans, and almost entirely ruined. In 1118, when it had again become prosperous, an accidental fire reduced the greater part of it to ashes. During the English wars in France it suffered much, repeatedly falling into the hands of opposite parties. For a long time it formed one of the most valuable possessions of the dukes of Brittany, but in 1499 the heiress of the dukedom, Anne of Brittany, who was born here, having here married Louis XII., it passed, with the rest of her possessions, to the crown of France. The most memorable event connected with the history of Nantes is the famous edict issued here by Henry IV., April 30, 1598, securing the Protestants in the free exercise of their religion, and making them eligible to all civil and military employments. The revocation of this edict by Louis XIV. in 1685 involved the kingdom in disasters from which it has never completely recovered. Pop. in 1881, 124,319.

NANTUCKET, an island of Massachusetts, south of the peninsula of Cape Cod, from which it is distant about 20 miles. It is about 90 miles S.S.E. of Boston. The island is 15 miles long, and its widest part is 11 miles. The town of Nantucket is situated at the entrance of a deep bay on the north side of the island, and has an excellent harbour, being capacious, deep, and nearly land-locked by two projecting points of beach. A great part of the inhabitants are Quakers. Little attention is paid to agriculture; and the sheep and cows of all the inhabitants feed in one great pasture. The right of the island was originally granted by William, earl of Stirling, to Thomas Mayhew, and conveyed by him to nine proprietors, who divided it into twenty-seven shares in 1659. It is mostly a joint property to this day, although the number of shares has increased to more than 3000. The inhabitants are mostly concerned in the whale-fishery, which has, however, greatly declined of late years, and many people have left the island. The amount of shipping has also greatly decreased. Population in 1880, 3726.

NANTWICH, a market-town of England, in the county of Chester, and 19 miles south-east of the city of that name, 4 miles south-west from Crewe, on branches of the London and North-Western and Great Western Railways, both of which have stations here. There is a fine cruciform church, besides several Dissenting places of worship. It was once famous for its salt-works, but at present its staple manufacture is shoes. Pop. (local board district), 7495.

NAPHTALI (Hebrew, my wrestling), the sixth son of Jacob, and the head of one of the twelve tribes. His mother was Bilhah, Rachel's handmaid. In the blessing of Jacob given to his children on his death-bed, according to the Authorized Version, Naphtali is called 'a hind let loose, and one that giveth goodly words.' This passage has given much trouble to commentators. Ewald translates the Hebrew, 'Naphtali is a towering terebinth. He hath a goodly crest.' If this rendering be accepted, the blessing would be a predictive allusion to the situation of the tribe at the very apex of the country, to the heroes who towered at the head of the tribe, and to the lofty mountains on whose summits their strongholds were perched. The tribe had its full share in repelling the incursions of the Canaanites during the first centuries of the conquest, and is specially mentioned in the song of Deborah (Judges v. 18), which celebrates the victory of Barak. The tribe disappears from history when Tiglath-pileser overran the north of Israel, and bore away the whole of the population to Assyria. Under the title of Galilee, the district occupied by the tribe became in New Testament times more famous than it had ever been before. It was the home of our Lord, and the native place of most of the apostles.

NAPHTHA. This is one of those words used by chemists in a somewhat vague sense. Formerly many liquids, all of which were volatile, mobile, strong smelling, and inflammable, were included under this name naphtha. Subsequently the name was restricted so as to include only the liquid hydrocarbons which issue from the earth in various localities. In more recent years the significance of the name naphtha has been again extended; it now includes most of the inflammable liquids which are produced by the dry distillation of organic substances.

Mineral or Native Naphtha is an inflammable liquid which issues from the earth in Canada and other parts of North America, in Persia, at Rangoon, &c., and associated with solid bitumen or asphalte in the great pitch lake of Trinidad. Native naphtha consists of a mixture of hydrocarbons, chiefly belonging to the paraffin series, but it also contains members of the olefine and of the benzene series.

Boghead Naphtha, which is also known as *photogen* and *paraffin oil*, is obtained by the dry distillation of Torbanehill mineral, or indeed of any cannel coal or bituminous shale. Besides liquid hydrocarbons this naphtha contains various acid and basic compounds, and also solid paraffin, which is held in solution by the fluid hydrocarbons. Paraffin oil may be separated into a great many substances, very similar to those obtained from native naphtha.

Coal Naphtha is obtained by the distillation of coal-tar. After the *light oil* has been separated it is agitated with sulphuric acid, allowed to settle, the supernatant liquid run off and rectified. This liquid

took [illegible] the remnant of Murat's army at Ostrowno [illegible] Witebsk on the 16th. On August 17th he [illegible] a stand at Smolensk against the whole of the French army, which the next day retired from the city in the night [illegible] The three succeeding months [illegible] Moscow. Kutusoff had [illegible] Napoleon resolved to [illegible] On the 7th September [illegible] Kutusoff [illegible] Moscow [illegible] the night the city, which had been [illegible] by its inhabitants, was found to [illegible] and the greater part of the city. The soldiers [illegible] to seek shelter from the [illegible] Napoleon attempted to negotiate [illegible] with [illegible] It was impossible [illegible] the Russians for an armistice [illegible] The French army was [illegible] more. For some time the weather [illegible] favourable, but [illegible] the winter set in earlier than usual, and with unparalleled severity. The line of retreat, to feed the [illegible] which had been wasted on the advance. Swarms of [illegible] Cossacks [illegible] the French, now [illegible] by cold, famine, [illegible] fatigue. When the invaders left Smolensk [illegible] November they numbered [illegible] and when they had fought their way over the Berezina [illegible] there remained [illegible] At Smorgoni Napoleon quitted the army on the 5th December, leaving Murat in command. He reached Paris on the 18th, and immediately ordered a fresh conscription, still determined to prosecute the war. But the spirit of Europe was now fully roused. Kings, ecclesiastics, and people were unanimously against the devastator of the Continent, the terror of whose name had been destroyed by his retreat from Russia. A sixth coalition, consisting of Prussia, Russia, England, Sweden, and Spain, was formed which early in 1813 sent its forces towards the Elbe. Napoleon had still an army of 350,000 in Germany. For some months he was everywhere victorious. He defeated the allies at Lutzen on 2d May, and at Bautzen 21st. On the 4th June he concluded with Russia a six weeks' armistice, which gave the allies time to organise and concentrate their forces, and what was of equal consequence, to gain over Austria. The campaign was opened on the 16th August. The allies advanced upon Dresden, where Napoleon had his headquarters. The three days' battle which ensued on the 27th August was the dearly bought victory for the French, who were now so outnumbered that their chief was compelled to fall back on Leipsig. There he was completely hemmed in, and in the great Battle of Nations, Volkers Wanderung, which was fought on the 16th, 18th, and 19th October, he was completely defeated. The retreat was almost as disastrous as that from Moscow; when he recrossed the Rhine he had only 70,000 or 80,000 men left. The fortresses held by the French in Germany and Poland were gradually reduced. On Napoleon's arrival at Paris on the 9th November he succeeded in obtaining from the senate, in spite of opposition in the legislative body, and the prevalent discontent of the people, a decree for a conscription of 300,000 men. With a fertility of resource, and a genius for combination almost miraculous, he was able to enter upon another campaign, which was this time to be conducted in France. From January to March he confronted the combined hosts of the allies, inflicting defeat after defeat upon them. But numbers were against him: a new and formidable enemy, Wellington, was rapidly advancing upon the capital from the south. On the 30th March the allies captured after a severe engagement the fortifications of Paris, and on the 31st Alexander and Wellington entered the city amid the acclamations of the people. On the 4th April Napoleon abdicated at Fontainebleau. He was allowed the sovereignty of the island of Elba, with the title of emperor, and a revenue of 6,000,000 francs. After bidding his army adieu he departed for his new abode, landing from the British frigate *Undaunted* at Ferrajo (4th May), and Louis XVIII. was restored. After a residence of ten months, most of which were spent in intriguing with the republicans and his own adherents, he made his escape from the island, and landed at Frejus on the 1st March, 1815, with an escort of 1000 of his old guard. As soon as his arrival was known Ney and a large part of the army joined him, and he made a triumphal march upon Paris, which he reached on the 20th. Louis was driven from his throne without a shot having been fired. The allies were startled at the astounding event. Their armies once more marched towards the French frontier. Napoleon, hastily reorganizing the government upon a rather more liberal basis than that of the empire, and having made vain attempts to open negotiations for peace, advanced to meet them. On the 15th June he crossed the Sambre at the head of 130,000 men to attack the English and Prussians under Wellington and Blucher, who were preparing to invade France on the Belgian frontier, while the Austrians attacked it on the Rhine. On the 16th he defeated Blucher at Ligny, while Ney held the English in check at Quatre-Bras. The Prussians made an orderly and leisurely retreat, pursued by a division of the French army under Grouchy. In order to preserve his communication with the Prussians Wellington fell back upon Waterloo, where he was attacked by Napoleon on the 18th. The British held their ground obstinately during the greater part of the day, and in the evening, when Blucher, who had outmanœuvred Grouchy, came up, the French were completely crushed, and Napoleon's power for ever broken. The retreat was a disorderly flight. The allies marched without opposition upon Paris. Napoleon again abdicated in favour of his son on the 22d; but being threatened by Fouché, who had assumed the direction of the government, and seeing no hope of escape from France, he surrendered at Rochefort to Captain Maitland of the British warship *Bellerophon*, claiming in pompous phrase the hospitality and protection of the British government. Captain Maitland was instructed to detain him as a prisoner, and then transfer him to the *Northumberland*, which was to convey him to the island of St. Helena, where he was to be confined for the rest of his life, according to a convention signed at Paris on the 20th August, between Great Britain, Austria, Russia, and Prussia. In July, 1816, General Sir Hudson Lowe was sent out as governor of the island. From the very first Napoleon seems to have cherished a strong antipathy against this officer, and endeavoured to gain the sympathy of the worldly spreading reports of the ill-treatment he was subjected to. One of his great grievances was that he was always styled General Bonaparte; another that he was not allowed to stroll about the island unaccompanied by a British officer. The governor had no power to remedy these subjects of complaint. In September, 1818, Napoleon's health began to be affected; but he would take no medicine, nor ride out, as advised, because he would not submit to the attendance of an officer. Towards the end of 1820 he grew worse, and at last on the 5th May, 1821, he died. On the 8th his remains were interred with

military honours in Slane's Valley, and in 1840 they were transferred to the Hôtel des Invalides at Paris.

NAPOLÉON II. (NAPOLÉON FRANÇOIS JOSEPH CHARLES BONAPARTE), son of the preceding, was born in Paris, 20th March, 1811, and in his cradle was proclaimed King of Rome. On the first abdication of the emperor he accompanied his mother, Maria Louisa of Austria, to Vienna. His title there was Duke of Reichstadt, and he was carefully instructed, especially in military affairs. His constitution was weak, and early symptoms of consumption unfitted him for the stern duties of a soldier's life. On his father's return from Elba an attempt was made to bring the young duke to Paris, but was frustrated by the Austrian government. He was appointed a lieutenant-colonel in 1831, and commanded a battalion of Hungarian infantry in the garrison of Vienna. He died at Schönbrunn, 22d July, 1832. He is said to have possessed many amiable qualities, and to have been a keen observer of human character; but his early death cut him off before he had reached an age in which he might have displayed any abilities he may have been gifted with. He never assumed the title of Napoléon II.; but on the accession of Louis Napoléon in 1852, some title being necessary, the late emperor took that of Napoleon III., which being recognized by the governments of Europe, implied the recognition of the former.

NAPOLÉON III. (CHARLES LOUIS NAPOLÉON BONAPARTE), Emperor of the French, was born, 20th April, 1808, at Paris, in the palace of the Tuileries. He was the last of the three sons born during the union of Louis Bonaparte, king of Holland, and Hortense de Beauharnais. His birth was hailed with great rejoicings throughout France, as that of an heir to the imperial throne, for by the law of succession the crown, in default of direct descendants of the emperor, at that time childless, could be inherited by the children of two of his brothers, Joseph, also without issue, and Louis. As the young prince's father and mother came to live separately soon after his birth (they had in fact been alienated before owing to the gallantries of the queen, and it is said to have been at the express command of the emperor, his brother, that King Louis allowed the child to be recognized as his), he was chiefly educated by his mother, who lived in Paris under the title of Queen of Holland. After the battle of Waterloo Hortense and her two surviving sons retired first to Augsburg, and subsequently to the estate which she had purchased, of Arenenberg, on the shores of Lake Constance. Young Louis was provided with the best tutors who could be got, the principal of whom was M. Lebas, a stern republican, who gave him his first but short-lived inclinations to republican principles. At the gymnasium of Augsburg he devoted himself enthusiastically to the study of history and mathematics; he also proved himself one of the best fencers and riders in the school. He was for a time a student at the military college of Thun, where he made considerable progress in the science of gunnery. The winter months of several years were spent in Rome, at the Villa Borghese. In 1830, when an insurrection broke out in the Papal States, Louis Napoléon and his brother took an active part in it. The interference of France and Austria in favour of the Pontifical government, however, soon put an end to the insurrection. The elder brother, Napoléon-Louis, died from sheer fatigue and anxiety at Forli, 17th March, 1831, and Louis himself fell dangerously ill at Ancona, and was only saved by the unremitting care of his mother. The Austrian occupation of Ancona drove them to a sudden and secret flight. They proceeded to France, but their incognito being betrayed they were compelled by Louis Philippe to leave the country in a few days, and sailed to England, whence they soon returned to the château of Arenenberg. In 1831 the leaders of the Polish insurrection offered him the command of their forces, as the nephew of the greatest captain of all ages, and also the crown of Poland. Much against the wishes of his mother he set out for that country; but heard on the way that the Russians had captured Warsaw, thus destroying all chance of success, and he therefore returned to Switzerland. By the death of the Duke of Reichstadt (otherwise called Napoléon II.), only son of the first emperor, he became the recognized head of the Bonaparte family, and from this time forward his whole life was devoted to the realization of a fixed idea that he was destined to occupy his uncle's imperial throne. He left no means untried by which he might hope to gain the sympathy of the French people, and keep his name prominently before them. Between 1832 and 1836 he published several books, which were well received by his countrymen; the most important being his Rêveries Politiques, in which the necessity of the emperor to the state is assumed throughout, as the only means of uniting republicanism with the genius and requirements of the French nation; Projet de Constitution; Deux Mots à M. de Châteaubriand sur la Duchesse de Berri (in verse); Considérations Politiques et Militaires sur la Suisse; and an exhaustive Manuel d'Artillerie. At length in 1836 he fancied the time had arrived when he could carry his lofty project into effect. He had arrived at the conviction that the French were tired of their citizen king, and that a personal appeal of the nephew of the great Napoléon would rally the nation round his standard. He obtained assurances of support from several military officers and others, and finally at a meeting in Baden he secured the aid of Colonel Vaudry, the commandant of artillery in the garrison of Strasburg. His plan was to seize that fortress, and with the troops who occupied it, whom he doubted not would readily join him, to march upon Paris before the government could organize any serious opposition. The soldiers of one regiment received him with enthusiasm when he was presented to them, but the great majority of the other regiments were true to their duty. The *coup d'état* turned out a ludicrous failure. The prince was taken prisoner, and conveyed to Paris; but the government of Louis Philippe was afraid of bringing a Bonaparte to trial, and shipped him off to the United States, where he was warmly received by the members of the Bonaparte family resident in that country. The mortal illness of his mother brought him back to Europe in less than a twelvemonth; he arrived at Arenenberg in time to see her die (5th October, 1837). The inhabitants of Thurgau openly expressed their sympathy for him in his bereavement; and shortly afterwards the commune of Salenstein bestowed upon him the rights of citizenship; and Diessenhofen elected him a member of the upper council. About this time, too, he attempted to defend publicly his conduct at Strasburg, and the French government demanded his extradition from Switzerland, which request that country refused to comply with; but in order to prevent serious misunderstanding between the two nations Louis Napoléon voluntarily withdrew to England. With certain members of the British aristocracy he lived on a footing of considerable intimacy, but failed in impressing anybody with a belief in his future and genius. In 1838 he published in London his Idées Napoléoniennes, in which the first emperor was represented as the founder and champion of the progressive development of the social and political institutions of modern Europe. In 1839 he was in Scotland, and took part in the famous Eglinton tournament. The universal enthu-

sm awakened in France by the transference of his uncle's remains from St. Helena to Paris in 1840 encouraged him to make another attempt on the throne of France. About the beginning of August he set sail in a steamboat from Margate, accompanied by Count Montholon and a retinue of about fifty persons. Landing at Boulogne he marched with his followers to the barracks, and called upon the soldiers to join his cause or surrender. They refused to do either, and after the exchange of a few shots the adventurers retreated towards their vessel, but were arrested in their flight. The prince was tried for treason before the house of peers, and was defended by the celebrated Berryer, but was sentenced to perpetual confinement in the fortress of Ham. This exclusion from the world gave him leisure for the exercise of his literary abilities, and the result was the following works: Aux Mânes de l'Empereur; Fragments Historiques; Analyse de la Question des Sucres; Réponse à M. de Lamartine; Extinction du Paupérisme; besides contributions to the Dictionnaire de la Conversation, and several articles to democratic newspapers. After remaining six years in prison he contrived (May, 1846), with the assistance of Dr. Conneau (who became, under the imperial régime, court physician), to make his escape disguised as a workman, and gained the Belgian frontier, whence he returned to England. On the outbreak of the revolution of 1848 he hastened to Paris, and in a letter to the provisional government declared that he came to serve under the republican flag (28th February, 1848). On the day following he issued another letter announcing that as the government deemed his presence in Paris dangerous he would immediately quit the country. He accordingly returned to London, where he served as a special constable on the occasion of the great Chartist demonstration of the 10th April. Several departments chose him as their representative in the National Assembly, but he declined at first to accept the position, until the election of the 17th September, when he was put forward by Paris and other five departments. He returned to Paris on the 24th, and three days later took his seat. He at once commenced his candidature, through his zealous associates, for the presidency. On the day of the election, 10th December, it was found that out of 7,500,000 votes Louis Napoléon had obtained 5,434,226, while Cavaignac, who followed second, had but 1,448,107. On the 20th the prince-president, as he was now called, took the oath of allegiance to the republic. For a time the greatest harmony seemed to be re-established; the president selected his ministers from the ranks of the various political parties, and strove to gain a majority in the assembly by the adoption of a strictly conservative policy. Shortly after the advent of the year 1849, however, it became evident that the friends of the president were in the minority, and that a conviction was spreading that Louis Napoléon was far less devoted to the interests of the republic than to his own. The French expedition to Italy and the siege of Rome were the subjects of violent discussions. On the 2d December, 1849, was formed a new ministry, the members of which were merely the tools of the president. A proposition was soon after laid before the Assembly for the increase of the civil list from 600,000 francs first to 3,000,000, then to 6,000,000, with his term of office extended to ten years, and a residence in the Tuileries. The struggle increased in intensity, and it was evident that a crisis was approaching. At last, on the 2d December, 1851, it came. On the evening of that day the president declared Paris in a state of siege, a decree was issued dissolving the assembly, 180 of the members were placed under arrest, and the people who exhibited any disposition to take their part were shot down in the streets by the soldiers. Another decree was published at the same time ordering the re-establishment of universal suffrage, and the election of a president for ten years. A rigorous system of repression was resorted to both in the capital and in the provinces, and the banishments to Cayenne and Algeria became painfully frequent. For some time previously the president had sought to increase his popularity by visits throughout the country, by pompous and flattering addresses; the soldiery were gained by vague promises, feasting, and other questionable means. He calculated, and calculated rightly, that when he had secured so many friends by plausible means, he could afford to risk foul means in getting rid of his enemies. When the vote came to be taken, on the 20th and 21st of the same month, it was discovered that 7,439,216 suffrages were in favour of his retaining office for ten years, with all the powers he demanded, while only 640,737 were against it. His enemies assert that this overwhelming majority was obtained by terrorism; there can be little doubt, however, but that many were wearied of the incompetent democrats, and that many more longed for a second Napoléonic era. As soon as Louis Napoléon found himself firmly seated he began to prepare for the restoration of the empire. In January, 1852, the National Guard was revived, a new constitution adopted, and new orders of nobility issued; and at last, on the 1st December, Louis Napoléon Bonaparte was proclaimed emperor under the title of Napoléon III., in accordance with the wish of the people, if any value can be put upon favourable votes collected by the creatures of those in power. On the 29th January, 1853, the new sovereign married Eugénie Marie de Montijo, countess de Teba, a Spanish lady of remarkable beauty; the result of this union was a son, Napoléon-Louis-Eugène-Jean-Joseph Bonaparte, prince imperial, born 16th March, 1856. The first year of his reign is marked by no event of political importance; two plots against his life (7th June and 9th July) were discovered by the police before the attempt to carry them out could be made. In March, 1854, Napoléon, in conjunction with England, declared war in the interest of Turkey against Russia — a war which was carried on by all the parties with great vigour, until a peace was concluded on the 30th March, 1856, the terms of which were the neutralization of the Black Sea, the abandonment by Russia of her protectorate of the Danubian principalities, and a re-arrangement of frontier territory between Russia and Turkey, to the advantage of the latter power. (See CRIMEA—History.) In the spring of 1855 the emperor and empress paid a visit to Queen Victoria. Shortly after his return to Paris (28th April) he was fired at by an Italian named Pianori; another attempt upon his life was made by Orsini (14th January, 1858). This last event was followed by serious complications with England, the emperor having made a demand upon the British government for an alteration of the laws affecting political refugees. The great increase in the naval and military forces of France caused uneasiness in England, but this feeling was allayed by the emperor's invitation to Queen Victoria to be present at the maritime fêtes at Cherbourg, where the British sovereign met Napoléon III. on the 4th and 5th August. About the beginning of the year 1859 it was evident that another European war was imminent. Northern Italy was groaning under the Austrian yoke; Sardinia demanded a separate government for Lombardy and Venetia, which Austria refused to grant. War was declared between that country and Sardinia about the end of April, and Napoléon took

up arms in favour of his Italian ally, Victor Emmanuel. The two allied sovereigns took the field in person. The first important battle of the campaign was fought at Montebello (20th May), and was closely followed up by those at Magenta, Marignano, and Solferino (4th, 8th, and 24th June), all of which were brilliant victories for the allies. By the terms of the Peace of Villafranca Austria ceded Lombardy to Italy, and the provinces of Savoy and Nice were given to France in recognition of her powerful assistance (10th March, 1860). In 1860 the emperor sent out an expedition to China to act in concert with the British, who were determined to enforce the Treaty of Tien-tsin, which provided for the residence of their ambassadors in Peking. The Anglo-French army accomplished a victorious march to Peking, and the Chinese emperor was glad to accept peace at the allies' terms. A second distant expedition was undertaken, but had not a like success. Towards the end of 1861 France, England, and Spain agreed to despatch a joint expedition to Mexico for the purpose of exacting redress of injuries of long continuance inflicted on the subjects of the respective allies, and the enforcement of pecuniary claims, which were obstinately contested by the Mexican government. The extravagant demands of M. de Soligny induced the English and Spaniards to believe that Napoléon had some ulterior object in view, and they withdrew from further intervention (April, 1862). The French army continued the quarrel alone. On the 10th June General Bazaine led his troops into the Mexican capital amidst many demonstrations of enthusiasm. An imperial form of government was initiated, and Maximilian, archduke of Austria, was placed at its head with the title of emperor. Supported as this prince was by French troops he could not preserve tranquillity in his dominions, and Napoléon, now recognizing the gravity of the position in which he had placed himself, and at the same time threatened with a war by the United States, withdrew his army early in 1867, and in June the unfortunate Maximilian, left to himself, was captured and shot at Queretaro. On the conclusion of the Austro-Prussian war of 1866 Napoléon, jealous of the growing power of Prussia, demanded a reconstruction of frontier, claiming, by way of compensation for his non-intervention in the quarrel, Prussian territory on the Saar, a claim which was peremptorily refused. The ill-feeling between the two nations was increased in 1867, when the King of Holland signified his intention to cede Luxembourg to France. The cession was strongly resisted by Prussia, and at the London conference (7th–11th May) the neutralization of the duchy was agreed to by treaty under the guarantee of the great powers. It could no longer be concealed, however, that a rupture between France and Prussia was imminent, and in 1870, on the Spanish crown being offered to Leopold of Hohenzollern, Napoléon demanded that the King of Prussia should compel that Prince to refuse it. Notwithstanding the subsequent renunciation of the crown by Leopold war was declared by France (19th July). (See FRANCO-GERMAN WAR.) On the 28th Napoléon set out to take the chief command. The emperor and the young prince imperial were present at the insignificant affair of Saarbrücken, which was magnified into a great French victory. In an almost incredibly small period of time one French army, under Bazaine, was cooped up in Metz, and the other, under Macmahon, was driven back on Châlons. Instead of retreating to Paris, as was expected, this army struck northwards with the intention of relieving Bazaine, but it was completely out-manœuvred by the Germans, and surrounded at Sedan (1st September). On the following day it was compelled to surrender. Among the prisoners of war was no less a personage than Napoléon himself. He had a personal interview with King William of Prussia, who assigned to him Wilhelmshöhe, near Cassel, as a place of residence during his captivity. One of the immediate consequences of this disaster was a revolution in Paris. Gambetta, Jules Favre, and several other members of the Corps Législatif, proclaimed a republic and the dethronement of the emperor (4th September). The empress and her son secretly quitted Paris and repaired to England, where they took up their residence at Camden House, Chislehurst. Here they were rejoined by the emperor, when he regained his freedom in March, 1871, and here he remained till his death, 9th January, 1873. His only child, the prince imperial, who had joined the British army in South Africa as a volunteer, was killed by the Zulus, 2d June, 1879. Besides the literary works already mentioned Napoléon III. is the author of an uncompleted History of Julius Cæsar (two vols. Paris, 1865–66), and various other productions collected into four vols. and published at Paris, 1854–57; also of a volume of Discours, Messages, et Proclamations (Paris, 1861). A biography of Napoléon III., by Blanchard Jerrold, was published in four vols. (London, 1874–82).

NAPOLÉON-VENDÉE. See BOURBON-VENDÉE.

NAPOLI DE ROMANIA, or NAUPLIA, a seaport town of Greece, Morea, near the head and on the east side of the gulf of the same name, occupying the site of the ancient Nauplia. The modern town stands upon the north-east side of a height, with a tabular summit, which projects from a steep ridge at the south-east angle of the Bay of Argos. The streets are narrow, but straight, with tolerable shops and good-looking houses. The town is inclosed by Venetian fortifications, with several batteries, and has two fortresses; one of which is on the summit of a precipitous rock, and inaccessible on all sides but one. The Bay of Nauplia has excellent anchorage all over it, and there is a good harbour for small vessels. Pop. 4598.

NARBONNE (Latin, *Narbo Martius*, or *Colonia Decumanorum*), a town of France, in the department of Aude, in a beautiful plain, surrounded by lofty hills, 33 miles east of Carcassone. It is inclosed by walls, and entered by four gates; has dark, winding streets, generally lined by ill-built houses, and is traversed by the Robine Canal. It is well supplied with promenades; one is formed by the esplanade situated near the centre of the town, and another, called l'Allée des Soupers, is particularly agreeable, having everywhere the appearance of a fine garden. The principal edifices are the church of St. Juste, formerly the cathedral, a Gothic structure, founded in 1272; the archbishop's palace, which has much the appearance of a fortress, and has immediately adjoining it a lofty square tower, rising up from the centre of the town far above all the houses; the old seminary, now used as barracks; three hospitals, a small theatre, library, &c. The manufactures consist of verdigris, linen, hosiery, and leather. There are also distilleries, dye-works, and brick and tile works. The trade is in corn, wine, brandy, oil, wax, salt, saltpetre, and excellent honey, produced in the district. Narbonne is one of the oldest towns of Gaul, and was the first colony which the Romans founded beyond the Alps. It became the capital of Gallia Narbonensis, but is very poor in Roman remains. One great cause of this was the barbarous procedure of Francis I., who employed the ruins of ancient buildings in constructing the present walls, which, accordingly, in many parts, exhibit bass-reliefs, friezes, and inscriptions. Pop. (1881), 23,134.

NARCEINE. This alkaloid is obtained from opium by precipitating the aqueous extract by means of ammonia, filtering, adding lead acetate, removing excess of lead, neutralizing with ammonia, and crystallizing. After purification narceine forms elongated silky needles, inodorous, having a bitter taste, easily soluble in boiling water, in alcohol, and in ether. This substance has the formula $C_{23}H_{29}NO_9$; with hydrochloric acid it combines to form a crystalline substance analogous with ammonium chloride. The double platinum chloride of this base also resembles in composition the double ammonium platinum chloride.

NARCISSUS, according to Greek mythology the son of the river-god Cephissus and the nymph Liriope, or, according to a less common account, Liroessa. Tiresias the seer predicted that he would live to old age if he should not become acquainted with himself. The surpassing beauty of the young Narcissus excited the love of all the maidens and nymphs. He was excessively vain and inaccessible to the feeling of love. Echo pined away to a mere voice because her love for him found no return. One of his rejected admirers prayed to Nemesis to punish him for his coldness of heart. Nemesis accordingly caused him to drink at a certain fountain, wherein he saw the reflection of his own beauty. Nothing could turn the unhappy youth from this fountain. His raging passion for himself destroyed him; and the gods transformed him into a yellow-leafed flower, which still bears his name. The account which Ovid gives in his Metamorphoses (lib. iii. 339-510) is of comparatively late origin. For another Narcissus see MESSALINA.

NARCISSUS, or DAFFODIL, a genus of plants belonging to the natural order Amaryllideæ. The species are chiefly natives of the south of Europe and the neighbouring parts of Africa and Asia. They have been cultivated from remote antiquity on account of the elegance of their flowers, which vary in colour, in the different species, from snow-white to the deepest yellow, and, besides, give out a delightful fragrance. On account of their easy culture they are common in the flower-gardens, and have produced numerous varieties. The root is a tunicated bulb. The leaves are linear, about as long as the stem, flat, or slightly canaliculate. The flowers are terminal, solitary, or in a cluster, never upright, but always inclining in one direction. Previous to their expansion they are contained in a membranous spatha. The corolla is double, the outer envelope consisting of six petaloid divisions, while the inner is cup-shaped, with the margin entire, or variously indented, in the different species. On this cup depends much of the beauty of these flowers, and it disappears on doubling them, which operation, unfortunately, is very easily accomplished.

NARCOTIC, derived from a Greek term signifying numbness or torpor, is the name given to a large class of substances which, in small doses, diminish the action of the nerves. Most narcotics have a degree of stimulating power which is manifested chiefly when they are given in moderate doses; when a full dose is given the result is sleep or coma, without any stimulation preceding it. The action of the narcotic depends on its being introduced into the blood, and thus being brought into contact with the nervous system. Its potency also depends on the mode in which it is made to communicate with the body. The same quantity which causes sudden death by being injected into a vein has no perceptible effect when rubbed on the outer unbroken skin. The effect is, moreover, modified by the susceptibility of the person to whom the narcotic is administered, and the quantity which is actually taken into the blood. Hence we see many animals devour henbane and other poisonous narcotic plants with impunity. The substances usually called narcotic belong to the vegetable kingdom, though prussic acid, besides being obtained by extracting amygdaline from bitter almonds and the cherry laurel, is also procured by the decomposition of animal substances. Chemistry has succeeded in regard to many plants in giving a separate exhibition of the material in which the narcotic substance is concentrated; for example, morphin from the poppy, and atropin from the belladonna, &c. It is usually a nitrogenous and carbonaceous substance. Narcotics, employed as medicines, are among the strongest and at the same time the most efficacious. They are administered with the view of inducing sleep or alleviating pain or spasm. The kinds most frequently used are the belladonna, thorn-apple (*Datura stramonium*), henbane, opium, tobacco, and alcohol. Pharmacy, to facilitate their introduction into the body, has made preparations of them under various forms, so that they can either be administered in their natural state, or as tinctures, extracts, plasters, salves, &c., according as each case may require. While in several countries the retail of narcotics is placed under no restriction, in others apothecaries and druggists are strictly prohibited from selling narcotics or preparations of them to any individual not provided with a medical certificate.

NARCOTINE. Opium contains a number of bases, among which one of the most prominent is narcotine. To prepare this alkaloid in a state of purity a very tedious process must be gone through, at the termination of which we obtain a colourless, transparent substance, crystallizing in right rhombic prisms, or sometimes in needles, which are insoluble in cold water, but soluble in hot water, alcohol, and ether; the solutions have a bitter taste. This alkaloid acts in a manner analogous with ammonia, combining directly with acids to form salts which have the general formula $C_{23}H_{29}NO_7m$, in which m represents a monobasic acid. Narcotine is very poisonous, 1·5 grains being sufficient to kill a dog very quickly.

NARD. See SPIKENARD.

NARSES, a statesman and general, born of obscure parents about the close of the fifth century. The place of his birth is unknown. It is supposed that he was sold as a slave in early youth, for his fate was that of many other boys in that condition: he was castrated. From some menial office in the imperial court at Constantinople he was promoted by Justinian I. to be his chamberlain, and ultimately keeper of the privy purse. In 538 he was placed at the head of an army destined to support the general Belisarius in the expulsion of the Goths from Italy; but the dissensions which soon arose between him and Belisarius occasioned his recall. Nevertheless in 552 he was again sent to Italy to check the progress of Totila the Goth. After vanquishing Totila he captured Rome. He also conquered Tejas, whom the Goths had chosen king in the place of Totila, and in the spring of 554 Bucellinus, the leader of the Alemanni. After Narses had cleared nearly all Italy of the Goths and other barbarians, he was appointed governor of the country, and ruled it fifteen years. His exactions pressed heavily upon the exhausted resources of the population, impoverished by the incursions of the barbarians, and excited the discontent of the provinces subject to him. On the death of Justinian his ascendency came to an end. The Romans complained of the crushing exactions of the governor to Justin II., and Narses was deposed in disgrace, and sought revenge by inviting the Lombards to invade Italy, which they did in 568, under Alboin, their king. Muratori, and other authors, have doubted whether Narses was concerned in the

invasion of the Lombards. After his deposition he lived in Naples, and died at an advanced age at Rome, about 570.

NARVA, or NAROVA, a town and fortress of Russia, in the government of St. Petersburg, and 79 miles south-west of that city, on the west bank of the Narova, which flows from Lake Tchudskoi, or Peipus, into the Gulf of Finland; population, 6175, principally Germans, mostly engaged in making nails and sawing timber. Its commerce is considerable; the exports are timber and boards, flax, hemp, corn, &c. The fisheries, particularly of salmon, are important. Narva is celebrated for the great victory gained by Charles XII. in its vicinity, over the Russians, in 1700. The latter retook the place by storm in 1704.

NARVAEZ, RAMON MARIA, DUKE OF VALENCIA, a distinguished Spanish statesman and general, was born at Loja in Andalusia in 1800. Early in life he entered the Spanish army, and he rapidly acquired distinction. When Gomez, the Carlist general, was engaged in his adventurous march through Spain in 1836, Narvaez, who then commanded a division under Espartero, was directed to pursue him, and having come up with him near Arcos, totally routed him. This was the decisive point in his career. Encouraged by the popularity which he had acquired, he devoted himself to politics, and became the rival of Espartero himself. Having taken part in an unsuccessful rising of the progressista party in 1838, he was compelled to flee from Spain, and for the next five years he lived in exile. At the end of that time he took advantage of the general feeling against Espartero; he hastened to Spain, and put himself at the head of the insurrection that had taken place, and in a very short time entered Madrid victorious (July, 1843). In the following year he formed his first ministry, and was rewarded for his services by receiving from Queen Isabella the rank of marshal, and the title of Duke of Valencia. His government was overthrown by court cabals in 1846, but he was soon recalled, and during the remainder of his life was several times intrusted with the formation of a cabinet. Although in his youth he had associated himself with the Liberal party, his policy assumed more and more a Conservative direction. His last ministry was formed in 1866, and from that time his efforts were chiefly directed to the support of the tottering throne of Queen Isabella. He died at Madrid on the 23d of April, 1868.

NARWHAL (*Monodon monoceros*). This curious animal is a member of the Delphinidæ or Dolphin family, which in turn forms one of the divisions of the Cetacean order of Mammalia. The Delphinidæ generally possess conical teeth in both jaws. The nostrils form a single opening, situated on the upper aspect of the head. The narwhal chiefly inhabits the Northern or Arctic Seas, and may attain a length of 15 or 16 feet. The body has the general fish-like conformation characteristic of the Delphinidæ and Cetacea as a whole. The body colour is an iron or blackish gray spotted with darker patches which intermingle with each other. The spots on the sides are of a paler or whitish-gray tint, the body colour in that region being white; and on the belly the light colour is unmarked by spots. The dentition of the narwhals differs from that of all other members of the Dolphin family. No teeth are developed in the lower jaw; whilst the upper jaw of the female animals is also generally destitute of visible or developed teeth, although two incisor teeth are represented, but do not cut the gum. The male narwhal similarly wants teeth in the lower jaw; whilst the upper jaw possesses two molars or grinding teeth in a rudimentary condition and concealed by the gum, and in addition two upper incisors or front teeth are present. The left incisor tooth—by some authorities, as will be presently stated, the *incisor* nature of this this tooth is disputed—is generally enormously elongated to form a spiral tusk which, springing from a permanent pulp, like the incisors of the Elephants and Rodents, continues to grow throughout the entire lifetime of the animal. This tusk may attain a length of 8 or 10 feet. The right or companion tooth usually remains small and rudimentary, but occasionally both teeth are developed to form elongated tusks, and the females are said sometimes to possess tusks. From the spirally-twisted conformation of the tusk it was formerly exhibited as the horn of the fabulous unicorn; and the popular name of 'sea-unicorn' has, from this peculiarity of structure, been applied to the narwhal. In former days, also, the horn was believed to possess valuable medicinal properties, and was supposed to be of special efficacy as an antidote against poisons and as a specific in fevers of a malignant type. The food of the narwhal appears to consist chiefly of Mollusca, and in its general disposition, notwithstanding its formidable armature, it is said to be inoffensive and peaceable. The Greenlanders name this animal the forerunner of the whale, from the belief that wherever the narwhal is seen the whales soon will follow. The male animal probably uses the tusk as a weapon of defence, serving to protect the females, which, especially at the breeding season, are gregarious in habits.

Some naturalists entertain the opinion that the tooth which is developed in the narwhal to form the tusk is not an incisor, but should rather be regarded as a canine or a molar, most probably the former. Incisor teeth are those which are invariably implanted in the *premaxilla* (see MAMMALIA), and as the tusk-like tooth springs from the maxilla or larger portion of the upper jaw, it is maintained accordingly that it cannot be an incisor. The probability of its being a canine tooth has therefore been argued for on reasonable grounds. As it stands, however, the narwhal's tusk represents the longest tooth met with in the animal series. (Pl. XXXVI.-XXXVII. fig. 9.)

NASEBY, a village in Northamptonshire, England, 12 miles from Northampton. In 1645 Fairfax and Cromwell entirely defeated Charles I. in the vicinity.

NASH, JOHN, an English architect, born in London in 1752. He appears to have commenced the preparation for his profession in early life, when he was articled to Sir Robert Taylor. He was the author or promoter of several very extensive improvements in London, the generally recognized utility of which made his name very popular. He laid out the Regent's Park, formed Regent Street, and built the United Service Club, Haymarket Theatre, and Buckingham Palace. The Pavilion at Brighton was also his work. He died in 1835.

NASH, RICHARD, commonly called *Beau Nash*, is known to fame as the celebrated master of fashion in the watering-place of Bath, in England. He was born in 1674 at Swansea, in Glamorganshire, and was intended for the law, but entered the army. Being disgusted at the discipline and his subordinate rank he soon forsook it, and took chambers in the temple. Here he devoted himself entirely to pleasure and fashion, and when King William visited the inn he was chosen master of the pageant with which it was customary to welcome the monarch. So pleased was William with the entertainment that he offered him the honour of knighthood; but Nash refused it, saying, 'Please your majesty, if you intend to make me a knight I wish it may be one of your poor knights of Windsor, and then I shall have a fortune at least equal to support my title.' In 1704 he was

appointed master of the ceremonies at Bath, and immediately instituted a set of regulations as remarkable for their strictness as for their judicious adaptation to the wants and society of the place. Nash now lived in the most splendid style, supporting his expenses by the gaming-table, and distinguished himself by a somewhat stagey benevolence. The chariot in which he rode was drawn by six gray horses, and attended by a long retinue of servants, and a band of French horns. His common title was the *King of Bath;* and his reign continued for more than fifteen years. His health then began to decline, and his resources grew less plentiful; and he died in 1761 in comparative indigence and solitude. He was buried, however, with great magnificence, at the expense of the city, and his epitaph, a neat tribute to his memory, was written by Dr. Harrington.

NASH, THOMAS, an English satirist and dramatist, born at Lowestoft, Suffolk, in 1558. He took the degree of B.A. at Cambridge in 1584, but was afterwards expelled for satirizing the authorities. He spent several years on the Continent, and in 1589 came to London. In the literary warfare then carried on between the Puritans and Prelatists Nash took an active part, espousing the cause of the latter, and proving himself a worthy opponent of Martin Marprelate. The following pamphlets are attributed to him: -Martin's Months Minde (1589), a Counter Cuffe given to Martin Junior (1589), an Almond for a Parrat, Mar Martin, and Anti-martinus. Among his best productions is his Pierce Penilesse, his Supplication to the Diuell (London, 1592, 4to); the First Parte of Pasquil's Apologie; and Christ's Tears over Jerusalem. In conjunction with Marlowe he wrote a drama, Dido, queen of Carthage, and in 1592 produced a comedy of his own, Summer's Last Will and Testament, which was acted before Queen Elizabeth. His pamphlets against Dr. Gabriel Harvey, and the replies by his opponent, were so outrageously virulent that the prelates of Canterbury and London caused them to be seized. Nash died in poverty in 1600 or 1601.

NASHUA, a manufacturing town of the United States, New Hampshire, county of Hillsborough, 31 miles south by east of Concord, on the right bank of the Merrimac, at the confluence of the Nashua. It was formerly called Dunstable. It has several extensive cotton manufactories, chiefly propelled by water-power; and manufactures of steam-engines, locks, guns, tools, shuttles, carpets, &c. By railway it is connected with Lowell, Worcester, and Concord. Pop. (1880), 13,397.

NASHVILLE, a town of the United States, capital of the State of Tennessee and of Davidson county, on the left bank of the Cumberland, where its steam-boat navigation ceases, and on the Nashville and Chattanooga Railway. It is pleasantly situated, partly on the sides and summit, and partly along the base of a limestone height; and consists of the town proper and suburbs, now almost equalling it in extent. The principal buildings are the state-house, court-house, university, about thirty churches, some of them beautiful and costly structures; numerous schools and academies; a lunatic asylum, and a penitentiary or state prison. The trade carried on both by the river and the railways is very extensive; and the vessels belonging to the town, and composed of steamers, comprise some magnificent passenger-boats. Pop. in 1880, 43,350.

NASMYTH, father and son, two eminent Scotch landscape-painters:—1. ALEXANDER, born at Edinburgh in 1758, went early to London, and studied under Allan Ramsay, painter to George III. He afterwards proceeded to Rome, where portrait, history, and landscape all occupied his attention. On his return to Edinburgh he commenced portrait-painting, but soon abandoned it for landscape, to which his own natural inclination much more strongly inclined him. He lived till 1840, attaining the advanced age of eighty-two. His style, though deficient in grandeur, is remarkable for its combination of simplicity and beauty; and though his pieces are very numerous, they are almost all carefully and even elaborately executed, without ever seeming overworked.—2. PATRICK, or, as he is frequently called in catalogues and biographies, PETER, son of the former, born at Edinburgh in 1786, early showed a decided turn for landscape-painting, and though an injury in his right hand seemed to preclude the possibility of his ever figuring as an artist such was his ardour and perseverance that he learned to use the pencil and brush with his left hand as easily as he could have done with his right. In London, where he became very popular, he was designated the English Hobbema, though minuteness of detail was almost the only thing which he had in common with the great Flemish master. He wanted the massive style necessary to represent the wild scenery of his native land, but was surpassed by few in depicting the meadows, slopes, brooks, green trees, and other softer beauties of an English landscape. He died in 1831.

NASSAU, formerly a state in the Germanic Confederation, now forming part of the Prussian province of Hesse-Nassau, corresponding nearly to the government of Wiesbaden. About one-third of the people are Calvinists, but since 1817 the Lutherans and Calvinists have been united under the title of the *Evangelical Christian Church.* The face of the country is rather uneven; the soil is fertile. Hochheim, Rüdesheim, Johannisberg, &c., yield the finest Rhenish wines. There are mineral springs at Wiesbaden (the capital), Niederselters, Ems, &c. The reigning dukes used to reside at Wiesbaden and the beautiful castle of Biberich. The founder of the House of Nassau appears to have been Otho of Laurenburg, brother of Conrad I. (in the tenth century). His descendants afterwards took the name of Nassau from a castle of that name. In 1255 two lines were formed, that of Walram, or the elder line, and that of Otho. From the former was descended the late ducal house of Nassau, which received the ducal title from the Confederacy of the Rhine, which it helped to establish in 1806. In consequence of the duke siding with Austria in the war of 1866 the duchy was seized by Prussia. See HESSE-NASSAU.

NATAL, a British colony on the south-east coast of Africa, between lat. 27° 15′ and 31° 23′ S.; lon. 28° 25′ and 31° 40′ E.; bounded on the west by a lofty mountain range, designated by the different names of the Quathlamba, Kathlamba, and Drakenberg Mountains; on the north and north-east by the Buffalo or Umzinyati, an affluent of the Tugela River, separating it from the Zulu country; on the east and south-east by the Indian Ocean; and on the south by the Umtamfuna and the boundary line separating it from Kaffraria. Greatest length, N.N.W. to S.S.E., 280 miles; greatest breadth, measured from the mouth of the Tugela (W.S.W.), 200 miles; area, about 18,000 square miles. The coast-line, which has a length of about 150 miles, contains the mouths of numerous streams, but is so destitute of creeks and bays that there is no one spot where sheltered anchorage can be obtained except at Port Natal, a fine circular bay near the centre of the coast, completely land-locked, capacious enough to contain whole fleets, and deep enough within to float the largest vessels, but unfortunately encumbered at its entrance by a bar, on which the water occasionally, but very seldom, exceeds 11 feet. The surface is finely diversified, rising

by successive terraces from the shore towards the lofty mountains on its western frontiers. These, forming the great reservoirs of the numerous streams which traverse the country in an easterly direction, often through precipitous ravines and rocky gorges, are loftiest in the south, where they attain the height of at least 8000 feet, and retain a covering of snow for above four months; towards the centre their height seldom exceeds 5000 feet, and towards the north, continuing to descend gradually, they present only the appearance of hilly ridges and elevated plains. From the main chain numerous transverse branches proceed nearly at right angles, and form a series of minor water-sheds, separating the basins of the different streams. The mountains descend very gradually on the west, and may be regarded as the abutments of a very elevated table-land, but they present very precipitous fronts to the east, and are so broken by chasms and ravines that they were at one time regarded as impassable. The prevailing stratified rocks are sandstone and slate, often thrown into confusion and pierced by igneous rocks, particularly basalt, greenstone, and porphyry, which assume the form both of continuous ridges and isolated hills, and often cover extensive areas. The mineral productions are principally coal, iron-stone, limestone, and marble. Gold has also been found near the Umtwalumi River, and in various other localities. The colony has a great advantage over most of the districts of South Africa in an abundance of perennial streams, which, though generally too shallow to be navigable, may easily be made available for irrigation. The most important rivers are the Tugela, which, with its tributary the Buffalo or Umzinyati, forms the northern boundary, and has a course of about 150 miles; the Umvoti, Umgeni, and Umkomanzi near the centre; and the Umzimkulu, which has a course of about 80 miles. The climate on the whole is extremely salubrious, and by no means trying to European constitutions. On the coast the range of temperature is from 47° to 88°, giving an average in summer of 76°, and in winter of about 55°; in the interior, at the town of Pieter-Maritzburg, the mean temperature of July, the coldest month, is 55°; of February, the hottest, 80½°; and of the whole year, 67°. During the rainy season (October to March) thunder showers are almost of daily occurrence, but hot blasts are rare, the winds from the interior being greatly modified by passing over the Drakenberg range. Long droughts are almost unknown. Under such a climate, and with a soil of considerable fertility, vegetation must obviously be vigorous. Timber-trees everywhere exist in sufficient numbers for the wants of the colony, and both on the western and northern frontiers form considerable forests, for the most part unincumbered by the underwood which prevails in Cape Colony. The soil on the banks of the rivers is generally rich and strong, and well adapted either for agricultural or grazing purposes. On the higher forest and table land cattle thrive well for at least nine months in the year; and in the more level districts of the interior wheat, barley, oats, beans, and vegetables of almost every description have been largely and successfully grown, even two good crops of maize can be raised in the year. In many parts the vine and fruit-trees thrive well, and in several places along the coast, more especially in the vicinity of Port Natal, cotton yields a superior and abundant produce. In the same locality tobacco, indigo, sugar-cane, and coffee grow well. The inhabited districts are now seldom visited by wild animals, but in the less frequented parts of the interior, herds of elephants, though greatly thinned in numbers, are occasionally seen; the lion and leopard are not uncommon, and hyenas, antelopes, jackals, wild dogs, ant-bears, and porcupines are numerous. The more remarkable birds are the vulture, rock eagle, and Kaffir crane. The hippopotamus has still his haunts in several of the rivers, and numbers of small crocodiles frequent the Tugela. In 1882 the value of exports to Britain amounted to £415,204, including wool, £328,392, hides and skins, £41,617, and unrefined sugar, £22,813; the imports from Britain were valued at £1,633,370.

Natal, on its erection into a separate colony in 1856, was first ruled by a lieutenant-governor, but has since 1879 been placed under a governor, assisted by an executive and a legislative council. The executive council is composed of the chief-justice, the senior officer in command of the troops, the colonial secretary, the treasurer, the attorney-general, the secretary for native affairs, and two members nominated by the governor from the deputies elected to the legislative council. The legislative council is composed of the colonial secretary, the treasurer, the attorney-general, the secretary for native affairs, and twelve members elected by the counties and boroughs. The first emigrant settlers of Natal were the Dutch Boers, who left Cape Colony in 1836, and by a treaty with Dingaan, the chief of the Zulu tribes, obtained a territory nearly identical with that of the present colony. A treacherous massacre of part of the Boers by Dingaan, in 1838, led to hostilities, in which Dingaan was ultimately driven beyond the frontiers. In 1839 the Boers removed to Port Natal, and proclaimed themselves an independent republic, and declaring their determination to establish diplomatic relations with European powers. The establishment of a hostile settlement at the only port between Algoa and Delagoa Bays, and at the only proper entrance from the coast to the interior of South Africa, was so obviously incompatible with British interests that a small force was despatched from the Cape in 1841. The Boers permitted it to land, but shortly after commenced open hostilities, and finally shut it in within an intrenchment, consisting of a rude barricade of wagons, and an earthen breast-work. Here the British succeeded in maintaining themselves till additional assistance arrived from the Cape. The Boers, completely defeated after a formidable resistance, retired for the most part beyond the Drakenberg range, and the sovereignty of Britain was finally established. The territory was proclaimed a British colony in 1845, and formed an integral part of the Cape of Good Hope settlement until 1856, when it was erected into a separate colony. For administrative purposes the colony is divided into nine districts or magistracies, of which that of Pieter-Maritzburg, centrally situated in the interior, contains a town of same name, which is considered as the capital, but the only seaport is D'Urban, capital of the district of same name, situated on the shore of Port Natal, and rapidly rising in importance. Pop. in 1882, 400,676, of whom 30,296 were whites, and 24,865 coolies, the remainder being mostly Zulu Kaffirs, who have renounced allegiance to their own chiefs, and have now the privileges of British subjects. See ZULULAND.

NATATORES, the order of Swimming-birds, distinguished by the generally shortened shape of the body and the elongated neck. The legs are placed towards the hinder extremity of the body, and are generally short. The position and conformation of the legs, whilst admirably adapted for swimming, renders the gait of these birds on land of a singularly awkward and unsteady nature. In some (for example, penguins) the legs are placed so far back that the birds can sit in an upright posture. The toes number three in front, the fourth or hinder toe as a rule being rudimentary, or it may be altogether un-

developed. In some cases (as in the Cormorants) the hinder toe is directed more or less completely forward, and is joined by the web or membrane to the other toes. In the Ducks, &c., the hinder toe, whilst present and developed, is not united to the other and webbed toes. The three anterior toes are always webbed in a more or less complete manner, varying from a state of complete union to one in which the membrane is deeply cleft between the toes, which are united by it at their bases only. This latter case is exemplified by the Grebes, in which the toes are surrounded by broad lobes formed by the divided membrane. The plumage of the Natatores is generally of abundant kind, and a thick under-coating of 'down,' placed next the skin, serves to insure and maintain the necessary degree of warmth. The 'uropygium,' or oil-gland, situated on the caudal or tail vertebræ, assumes a large development in this order of birds, and by means of the oily secretion of this gland the feathers are dressed and protected from the damping action of water. The operation of 'preening,' or of dressing the feathers with the unctuous matter of the gland, is familiar to all, as observed in the ducks and water-fowl generally. The wings vary greatly in development throughout the order. In the penguins they are reduced to mere fin-like expansions covered with scales, and whilst useless as organs of flight, these members yet form most efficient aids in swimming, and through their help the penguins dive under water with great ease and dexterity. In other natatorial birds, exemplified by the frigate-birds, gulls, &c., the wings reach a high degree of development, and serve to sustain their possessors in long and extensive flights. As a rule those species possessing great powers of flight are the most feeble divers, and these forms seize their prey by darting into the water whilst on the wing. The beak varies in form, and its conformation has been used as a guide, in part, to the classification of the order. The natatorial birds are for the most part gregarious in habits, and are generally polygamous, the males attending each to several females. They belong to the Autophagous section of the bird class, in that their young are born in a mature state and are able to feed themselves, to swim, and to run about immediately on quitting the egg. In their distribution the Natatores belong chiefly to the Arctic or northern regions. The nests are generally of simple construction.

The first of the sub-orders or sections into which this order of birds has been divided is that of the *Brevipennatæ*, represented by the Penguins (*Spheniscidæ*), Auks, and Puffins (*Alcidæ*), the Guillemots (*Uria*), Grebes (*Podicipinæ*), and Divers (*Colymbidæ*). The wings in this section are short, and may be functionally useless for flight, as in the penguins. The legs are situated far back on the body, and the tail is shortened. The hinder toe is rudimentary or wanting, as in the guillemots; the feet are provided with a web or membrane, which in most cases unites the developed toes, but which, as in the Grebes, may be deeply cleft. The *Longipennatæ*, forming the second section of the order, have powerful wings; the bill may be hooked or pointed; the hinder toe is never joined by a web to the other and front toes. Of this section the *Laridæ*, including the Gulls and Terns; and the *Procellaridæ*, or Petrels and Albatrosses, are the representative groups. The *Totipalmatæ*, or third section of the order, is represented by the Pelicans (*Pelecanidæ*), Cormorants (*Phalacrocoracæ*), Gannets (*Sulæ*), Frigate Birds (*Tachypetes*), Tropic Birds (*Phaeton*), and Darters (*Plotinæ*). The hinder toe or hallux in these birds is directed forwards or inwards, and united to the other and front toes by the web. The wings are well developed and the legs are short. Some of these forms—of all the Natatores—perch upon trees. The *Lamellirostres*, forming the fourth and last division, derive their name from the presence of 'lamellæ,' or transverse plates, with which the edges of the flattened bill are provided, the function of these lamellæ being that of serving to strain the food from amongst the mud in which these birds grope. The beak is invested by a soft membranous skin, and is rendered highly sensitive by receiving a rich supply of nervous filaments, thus constituting it an organ exercising the sense of touch as well as prehension. There are four toes, the fourth or hinder one being free and ununited by a membrane; whilst the three front toes are invariably webbed. The windpipe or trachea in the males of this section may be of large size, and may exhibit a coiled or contorted appearance, which, together with the structure of the larynx or organ of voice, serves to produce the peculiar harsh voice distinctive of these birds. The body is of heavy build, and the legs are placed towards the hinder extremity of the body. The wings are of moderate size and power. The Ducks (*Anatidæ*), Geese (*Anserinæ*), Swans (*Cygnidæ*), and Flamingoes (*Phœnicopteridæ*) form the typical groups included in the Lamellirostral division. The latter forms seem to connect the order Natatores with the Grallatorial or Wading Birds, the flamingoes uniting the elongated legs of the waders to the webbed toes of the swimmers, whilst the bill is lamelliform. (Pl. CL.–CLI. and CLII.–CLIII.)

NATCHEZ, a city of the United States, in Mississippi, on a bluff on the left bank of the Mississippi, 200 feet above the level of the stream; 279 miles above New Orleans. A portion of the city is built on the margin of the river; it is laid out in the form of a parallelogram, with streets intersecting each other at right angles; but the site is very uneven. Almost every house has a piazza and a balcony. The public buildings are a court-house, jail, several churches, a hospital, several orphan asylums, a masonic hall, and a seminary called the Natchez Institute. Natchez is a great cotton mart, and has oil-mills, and an extensive and increasing trade. The heavy shipping business is transacted in the lower part of the town, and there the warehouses of the traders are situated. Pop. (1880), 7058.

NATHAN, an eminent Hebrew prophet in the times of David and Solomon. He first advised, and then, in consequence of the word of the Lord that came to him by night, dissuaded the king from the intention he had announced of building a temple. He also reproved him with equal candour and wisdom for his misconduct in the affair of Bathsheba. He was afterwards intrusted with the education of Solomon, whom he anointed as king, and was the historian both of his reign and that of his father. The loss of his Life of David is much to be deplored. His reputation for wisdom induced Lessing to name one of his dramas after him.

NATHANAEL, conjectured on very strong grounds to be the same person as the apostle Bartholomew, was a native of Cana in Galilee, and attached himself to our Saviour when he had convinced him of his divine mission by a striking testimony to the humility, simplicity, and purity of his heart. In the three first Gospels, supposing him to be identical with Bartholomew, he is always mentioned in connection with Philip, but never under the name of Nathanael, whereas in the Gospel of John he is never mentioned as Bartholomew. On the hypothesis that he was one of the twelve we must identify him with Bartholomew. St. Augustine, however, rejects this hypothesis, and J. Kindler maintains that they were different persons. Tradition holds that Nathanael was the bridegroom at the marriage of Cana, and that he

was one of the two disciples whom Jesus overtook on the road to Emmaus.

NATICA, a genus of Gasteropodous Molluscs, forming the type of the family Naticidæ. The shell is globose in form, the spiral portion being minute and indistinctly marked. The shell is smooth and porcelain-like, and its aperture is of large size and semicircular form. The 'columella' or pillar of the shell is thick, and the inner lip of the shell is broad. The outer lip is of acute conformation. The animal appears large in proportion to the shell, the foot especially being of extensive proportions. The mantle-lobes partly conceal the shell. The mouth is hidden beneath a broad mantle fold or veil. The eyes are placed at the bases of the feelers or tentacles. An operculum, which may be horny or calcareous, is always present. Most of the genera of this family (Naticidæ) are marine, whilst others inhabit fresh water. Seven or eight species are British, the largest being the *Natica monilifera*. *N. Alderi* is also a familiar species.

NATION (Latin, *natio*, from *natus*, born), either a people inhabiting a certain extent of territory and united by common political institutions, or an aggregation of persons of the same ethnological family, and speaking the same or a cognate language. The former is the ordinary sense in which the term is understood, but recent circumstances have brought the latter sense into familiar use. A class of modern politicians, mainly continental, assume that nations should be limited only by nationalities, and should be homogeneous in race. No length of established connection, no treaty obligation, no political necessity or expedience should stand in the way of the reconstruction of nations on this principle. But the different European races are so commingled that the ethnological principle of reconstruction, pure and simple, is an impossibility. Language, again, is no satisfactory determining test, for it is in perpetual flux, and border races generally speak two languages. The proper end of all government is not the discrimination of races, but the well-being of its subjects. And, in fact, homogeneous peoples have frequently been misgoverned and torn by internal dissensions, while an aggregate of diversified nationalities has been frequently well-governed, and for all useful and practical purposes moulded into a compact and harmonious organism. In some universities, as in those of Glasgow and Aberdeen, for instance, the students are divided into 'nations' to distinguish those from different districts or countries. This custom originated in the University of Paris antecedent to the institution of faculties, when persons from the same country were united under the same institutions and masters.

NATIONAL AIRS. National music is modified by the construction of the language, by the poetic measure most admired, by the peculiar movements of the national dances, and by the character and register of the musical instruments. Besides, there is a difference in pitch, range, and quality between the voices of some nations and those of others; and the climate, occupations, and habits of a people may influence considerably the character of their music. Nor is the national beverage without effect on the national music, as may be seen in the respective instances of wine-making and beer-drinking communities. Nations have favourite airs, which are generally associated with words, and the complexion of these will sensibly influence the music, for we should expect the subject-matter of a serenade and of a drinking song, of a cradle song and of a student song, to determine the character of the music, and to be at once recognized in it. The songs most likely to become national are those which touch a chord in the national breast, such as loyal, patriotic, and war songs. The two national airs of England are God Save the Queen and Rule Britannia. The words and music of the former are probably of considerable antiquity, and did not settle down to their present form till about 1740. The music of Rule Britannia is by Dr. Arne, and the words by Thomson (1740). The French national air is the famous Marseillaise. (See MARSEILLAISE HYMN.) During the second empire Partant pour la Syrie, composed by the emperor's mother, was almost recognized as the national air—a distinction purely factitious, as the words have no special connection with France, either in history or sentiment. Belgium, Denmark, Sweden, and Norway have each their national popular songs. The Russian Hymn, adopted in 1830 by command of the Czar Nicholas, is one of the finest national airs. Germany, as might be expected, is pre-eminent in this department. The famous Austrian Hymn was composed by Haydn in 1797.

NATIONAL ASSEMBLY and NATIONAL CONVENTION. See FRANCE—History.

NATIONAL ASSOCIATION FOR THE PROMOTION OF SOCIAL SCIENCE. The institution of the British Association for the Advancement of Science (which see) has proved most successful in accomplishing the objects which it was designed to promote—the increased cultivation of physical science and the facilitating of friendly intercourse among its followers. In addition, however, to the subjects relating to this branch of knowledge, whether as regards purely theoretical science or the vast field of study and practice opened up by its application to the various arts and manufactures, a series of highly important questions bearing vitally on the well-being and prosperity of the country have largely engaged public attention of late years. These subjects are left comparatively untouched in the deliberations of the British Association, but are nevertheless both highly interesting in themselves, and demanding every day more and more the attention of our philanthropists and legislators. They comprehend the science of social economy in all its branches, as regards public health and morality, education, crime, with its causes, prevention, and punishment, the mutual relations of employer and employed, and generally all those phases and laws which result from the social compact and develop themselves proportionately with the advancement of civilization and refinement. The project of establishing an association which should be specially devoted to the investigation and discussion of these topics was first suggested to Lord Brougham in the end of 1856, but no decided steps were taken towards carrying it out till 29th July in the following year, when a meeting was held at his lordship's residence in Grafton Street, London, to consider the best means of uniting together all those interested in social improvement. Forty-three persons, including many distinguished names, both male and female, were present. A resolution, affirming the necessity for a closer union among the supporters of the various efforts now being made for social advancement, and establishing the National Association for the Promotion of Social Science, was moved by Mr. Sydney Turner, and seconded by Lord Ebrington. The first meeting was appointed to be held at Birmingham in the succeeding month of October, with Lord Brougham as president, who accordingly, at the subsequent opening of the association, delivered the first inaugural address. The second annual meeting of the association was held in 1858 in Liverpool, under the presidency of Lord John Russell, and meetings have subsequently been held in Edinburgh, Glasgow, Dublin, Manchester, &c. The results of all of the meetings have been most gratifying, and inde-

pendent of the valuable information furnished by the papers read to and elicited in the discussions of the association, a friendly feeling of co-operation has been induced among all having the welfare of the community at heart, which cannot fail to be productive of the most beneficial consequences.

NATIONAL DEBT. See BRITAIN—Financial History—and FUNDS.

NATIONAL DOMAINS. See DOMAIN.

NATIONAL EDUCATION. See SCHOOLS.

NATIONAL GALLERY, THE. This collection of paintings, situated in Trafalgar Square, London, originated in the collection formed by Mr. Angerstein, consisting of thirty-eight pictures, twenty-nine by the old masters and nine by British painters, and purchased in 1824 for £57,000, as the nucleus of a national gallery. Fully a year later Sir George Beaumont presented twenty-nine high class pictures, the British Institution three, two private individuals one each, while government purchased four by old Italian masters. Thus was the National Gallery instituted, but for a time its progress was slow. Till 1853 the purchases were few, and the institution depended for its growth on bequests and gifts, the most munificent of which was that of Mr. Vernon in 1847—a collection of 157 works of English painters. At that date a select committee of the House of Commons recommended that not only should beautiful works of art be purchased, but that they should be exhibited in such a way as to 'instruct the public in the history of that art and of the age in which and the men by whom these works were produced.' The institution was reconstituted, three new offices were created, and instead of an occasional grant the estimates were annually to contain 'a sum expressly for the purchase of pictures for the National Gallery.' A very remarkable advance was thereafter made, and the pictures purchased have been of a high character. At the death of Sir Charles Eastlake, the first director, in December, 1865, the number of purchases that had been made amounted to 251, representing works by Italian, Flemish, Dutch, German, British, French, Spanish, and Byzantine masters. Eastlake's purchases had been numerous and distinctive in the Italian, especially in the early Italian schools, but he seems to have made no serious attempt to strengthen the Spanish section of the gallery, which is still the weakest. Mr. (afterwards Sir William) Boxall, R.A., the second director, purchased several pictures at a high price, respecting the merits and genuineness of which much acrimonious criticism was evoked. In March, 1871, a valuable prize was secured by the purchase for £75,000 of the Peel collection, consisting of seventy-seven paintings and eighteen drawings, selected with that taste and judgment for which Sir Robert Peel was distinguished. The National Gallery has thus sprung from small beginnings to something not unworthy of the great and wealthy nation to which it belongs. It now comprises fully 1200 pictures, and from the care with which these have been selected it has a very high reputation among European galleries, though far down in the scale if regard is had to mere numbers. The collections at Versailles, Dresden, Madrid (in the Royal Museum in the Prado), the Museum of the Louvre, the Hermitage at St. Petersburg, the Gallery of Berlin, the Belvidere at Vienna, the Pinakothek of Munich, and the Gallery of the Uffizi at Florence are all superior in numbers, that of Versailles consisting of more than 3000 paintings, chiefly of French battles. It is unfortunate that the building at Trafalgar Square is totally inadequate to contain the treasures of the National Gallery, and that these are in the meantime divided, many of the pictures of British artists being temporarily exhibited in the South Kensington Museum. It was at one time contemplated to erect a new National Gallery, designs for which were prepared by E. M. Barry, R.A., and approved of. Meanwhile, however, it has been determined merely to enlarge the existing edifice, and it has been announced that the extensions will be on a scale sufficiently large not only to accommodate all the paintings at present belonging to the nation but to provide space for future additions to the national art-treasures for many years to come.

The National Portrait Gallery is entirely independent of the National Gallery, and owes its institution very much to the zealous and enlightened efforts of Earl Stanhope, then Lord Mahon. A board of trustees was appointed late in 1856, and by the end of the following year twenty-three portraits had been secured—some of them purchases and others gifts. The difficulty of the trustees is to guard against improper admissions in the way of donation, and therefore no donation can be accepted unless approved of by at least three-fourths of the trustees present at a meeting. Improper purchases are provided against by a judicious appointment of trustees of various tastes, pursuits, and politics, who take into account the celebrity of the person represented and whether the portrait 'may be valuable as illustrating the civil, ecclesiastical, or literary history of the country, and who are bound, except in the case of the reigning sovereign and consort, not to admit the portrait 'of any person still living or deceased less than ten years, unless all the trustees in the United Kingdom, and not incapacitated by illness, shall either at a meeting or by letter signify their approbation.' The official report, published in April, 1883, informs us that the National Portrait Gallery then contained 600 portraits, under the varieties of 'paintings, busts, and medallions, and casts of the earlier sovereigns from their tombs in Westminster Abbey.' Its treasures, like those of the National Gallery, outgrew the accommodation for them, and they have been removed to South Kensington.

NATIONAL GUARDS. See GUARDS.

NATIONS, LAW OF. By *national law*, or the *law of nations*, we understand that portion of public law which concerns the rights, duties, and obligations of nations. Nations are considered as moral persons, having duties to perform as well as rights to enforce, and are bound to the observance of the great principles of justice, which are applicable to the relations which subsist between each nation and its own subjects, and between each nation and every other nation. International law is divisible into two heads, the one which regulates the rights, intercourse, and obligations of nations, as such, with each other; the other, which regulates the rights and obligations more immediately belonging to their respective subjects. Thus the rights and duties of ambassadors belong to that head which respects the nation in its sovereign capacity; and the rights of the subjects of one nation to property situated within the territory of another nation, belong to the latter head. The former is frequently denominated the *public law of nations*, and the latter the *private law of nations*. The great foundation on which the law of nations rests is the law of nature, or that system of principles which is deduced by human reason from the nature of man, and his social obligations, for the direction and government of human societies. The law of nations may be divided into two great classes of principles, namely, those which arise from natural or universal law, and those which are of mere positive institution. The former is denominated the *universal law of nations;* the latter the *positive law of nations*. And the latter is again divisible into the *customary law*, or that which arises from the silent consent of nations,

as evidenced by general usages and customs, and habits of intercourse; and the *conventional law*, which arises from express compacts, or treaties between nations, or in a particular state from the fundamental constitution of such state. When any society of men, or body politic, is united for the purposes of government, and for mutual protection, we are accustomed to call such society or body politic a *state*, or *nation*. To every state or nation we ascribe the attributes of sovereignty, independence, and equality with every other. Every nation which governs itself, without dependence upon any foreign power, is deemed a sovereign state. Nations are deemed sovereign not so much because they possess the absolute right to exercise, in their actual organization, transcendent and despotic authority, but because whatever they do exercise is independent of and uncontrollable by any foreign nation. The sovereignty of many nations is, in its actual organization, limited by their own constitutions of government; but, in relation to all foreign states, the sovereignty is, nevertheless, complete and perfect. In respect to each other, then, nations possessed of sovereignty are deemed equals, and are entitled to the same general rights and privileges. Relative strength is of no consequence; it neither confers nor abstracts any sovereign power. In respect to its own internal concerns every nation possesses general and supreme authority. The authority of the nation over all its members is, by the very act of association, deemed, in all that concerns the general welfare of the nation, complete and supreme. All the members are bound to obedience and allegiance; and, in return, the nation is bound to protect and preserve its members.

Every nation possesses a right to all territory within its own limits not belonging to private persons; and as all such territory is held for the national benefit, it may be alienated and disposed of according to the will of the nation. All property, however acquired by the nation, is subject to the like disposition. Thus all the national revenues arising from taxation or rents, or other income or resources, may be applied as the nation deems proper for its own welfare. But there are many things which a nation holds for the public use and benefit, in respect to which all the subjects possess, or may possess, a common right of enjoyment. Thus rivers, lakes, and arms of the sea, within the limits of the territory of a nation, are possessed and owned by the nation in virtue of its occupation of the adjacent country; and until alienated they are held for the common benefit of all the people, and may be used by all the people for the purpose of fishing and navigation. Of the like nature are roads, and highways, and canals established and supported at the expense of the nation. All these territorial rights and possessions, however, are subject to the municipal regulations of every nation, according to its own choice and constitution of government.

The basis on which all the rights and duties of nations, in their intercourse with each other, rest is, that they are all moral persons, and that each has a perfect equality, in sovereignty and social rights, with every other. They are treated as moral persons possessing a sense of right and wrong, and responsible for a just discharge of all the duties common to the human race. The other maxim to which we have alluded is the perfect equality of nations, whether great or small, maritime or inland, strong or weak. In this respect they are treated like individuals who, however differing in capacity and strength, are deemed entitled to equal rights and privileges in the general scale of the human race. The rights and duties of nations, in regard to each other, may be divided into two general heads—those which belong to a state of peace, and those which belong to a state of war.

We shall first treat of those which belong to a state of peace. 1. Every nation is bound to abstain from all interference with the domain of other nations. That domain extends to everything which a nation is in possession of by a just title, whether it be by purchase, or cession, or conquest, or by a title founded solely on a long possession. 2. Where two nations border on a river, or lake, or arm of the sea, it often becomes a matter of dispute how far the limits of each extend, and how far either may exercise exclusive jurisdiction over such places. No principles can be laid down which will embrace all cases of this sort. If a nation has long enjoyed the exclusive use of a river, lake, or arm of the sea, for navigation, fishing, &c., that is understood to strengthen its title of possession. If no priority of occupation is or can be established by either of two nations inhabiting the opposite banks of a river, each is considered as having an equal title; and in such a case the right of dominion of each will extend to the middle of the stream of the river (*usque ad filum aquæ*). Where a nation possesses the territory on both sides of a river, so far as such territory extends it is deemed to be the owner of the river itself; but other nations, owning in like manner above or below on the same river, may have a right of passage, or other servitude. In respect to the main sea the general doctrine is, that all nations have equal and common rights on the high sea, and they are not bound to admit any superiority there. The sea which washes the coast of a nation, to the extent of a marine league, or 3 miles, is now deemed to be a part of the territory of the nation, over which it may, for its own protection, exercise an exclusive jurisdiction. And, in respect to persons subjected to its laws, every nation now claims a right to exercise jurisdiction on the high seas, for the purpose of enforcing not only the law of nations but its own municipal regulations. 3. From the exclusive jurisdiction and sovereignty of a nation, within its domain, it follows that no other nation has a right to punish for crimes committed by its own subjects therein. No foreign nation has a right to pursue any criminal or fugitive from justice therein; but its claim, if any, is a mere right to demand him from the nation itself. 4. Every nation has a right to regulate its own intercourse and commerce with other nations, not denying them just rights, in such a manner as is most conducive to its own prosperity and interests. In respect to its conduct towards foreigners every nation is under a moral obligation to treat them with respect, kindness, and humanity during their sojourn within its territories. And if a nation allows foreigners to enter into its territory, it is bound to respect their rights, so long as they conduct themselves peaceably; and if, in breach of good faith, it proceeds to punish them vindictively, when they have committed no offence, it is justly responsible for its conduct to the nation to which they belong. Foreigners, however, are bound to obey the laws of a country as long as they reside within it, and under its protection. The property held by foreigners within a country, according to the laws, ought to be protected in the same manner as that of natives. It is a general rule among nations to regulate the descent, distribution, and alienation of real or immovable property exclusively by the laws of the country wherein it lies. As to personal or movable property, it is now a common custom to allow foreigners the liberty of disposing of it by will or otherwise, according to the laws of their own country, or of their own permanent domicile. 5. How far a nation is bound to concede to others the

exercise of any right within its own territory has been a matter of much discussion among writers on the law of nations. To this there can be little more than a general reply, namely, that it is the duty of every nation to conform to the necessities of others whatever may not be unjust in itself, or affect its interests, or endanger its power or property. 6. The intercourse between nations can scarcely be beneficially carried on without the instrumentality of some public agents. They may have disputes to adjust, injuries to redress, rights to ascertain, mutual objects and interests to promote—all of which may require great deliberation and many conferences. Hence arises the right of every nation to send and to receive ambassadors and other public ministers. And this right of embassy has always been deemed peculiarly sacred. The law of ambassadors forms, therefore, a large head in the law of nations. As representatives of the nation itself ambassadors and other public ministers are exempted from all responsibility to the civil and criminal jurisdiction of the countries to which they are sent. Their persons are held sacred and inviolable. Their property, and servants, and retinue enjoy a like privilege. These rights, and privileges, and immunities are not, however, to be considered as favours granted to the individual, but as a sovereign claim and public security insisted on by all nations, and refused by none. 7. It is through the medium of ambassadors and other public ministers that treaties, conventions, and other compacts between nations are usually negotiated, thus forming a positive code for the regulation of their mutual rights, duties, and interests. In the modern practice of nations such treaties and compacts are not generally deemed final and conclusive until they have been ratified by the respective governments to which the negotiators belong. When made such treaties possess the highest sanctity and obligatory force. Many rules have been laid down for the interpretation of treaties. But they all resolve themselves ultimately into one great maxim, which is that they are to be understood and construed according to their obvious meaning, and the intention of the contracting parties. 8. As to the modes of terminating disputes between nations. These are various—by compromise, by mediation, by arbitration, by conferences and congresses, by tacit acquiescences in the claims of the other side, and lastly, on a failure of all these, by an ultimate resort to arms. This resort may be by a limited or by an unlimited warfare—by a limited warfare, as by retaliation, by reprisals, or other modified redress; by an unlimited warfare, as in cases of general hostilities in a public war.

And this leads to the consideration of the rights and duties of nations in regard to each other which belong to a state of war—First, between the nations at war. The right of declaring war results from the right of a nation to preserve its own existence, its own liberties, and its own essential interests. In a state of nature men have a right to employ force in self-defence; and when they enter into society this right is transferred to the government, and is an incident to sovereignty. 1. What are just causes for entering into a war is a question which has been much discussed by publicists. In general it may be said that war ought not to be entered into except for very cogent reasons, as it necessarily involves much personal suffering, and many private as well as public sacrifices. Defensive wars are necessarily justifiable from the fact that they involve the existence or safety of the nation and its interests. But offensive wars are of a very different character, and can be justified only in cases of aggravated wrongs or vital injuries. 2. In respect to the mode of declaring war. It may be formal, as by a public declaration; or informal, as by actual hostilities. In modern times nations are accustomed generally to make a public declaration, and to justify themselves before the world by a manifesto of their reasons. 3. The effects of a declaration of war. The first effect is to put all the subjects of each of the nations in a state of hostility to each other. They are not at liberty to engage in trade or commerce, or contract with each other; and they retain the character of enemies in whatever country they may be found. In the next place, all the property belonging to each is deemed hostile. If it be personal property it may be captured as prize; if lands, it may be seized and confiscated at the pleasure of the sovereign; if it be merely in debts or stock it may, in the extreme exercise of the laws of war, be equally liable to confiscation. In general each nation restrains the right to make captures and to carry on hostilities to such persons as are in public employment, or to such as receive a public commission for this purpose. 4. But although the extreme rights of war are thus rigorous and oppressive there seems no reason to exclude, even between enemies, the common duties of humanity. As soon as the battle is over the conquerors are bound to treat the wounded with kindness, and the prisoners with a decent humanity. And there are some things which seem positively prohibited from their cruelty and brutal barbarity; such are the violation of female captives, the torturing of prisoners, the poisoning of wells, the use of inhuman instruments of war. 5. In time of war there is occasionally an intercourse between the belligerents which should always be held sacred. Thus the granting of passports, and ransom of prisoners and property; the interchange of prisoners by cartels; the temporary suspension of hostilities by truces; the passage of flags of truce; the engaging in treaties of capitulation, in cases of besieged armies or cities—all these are matters which are held in great reverence, and demand the exercise of the utmost good faith. 6. In respect to captures made in war they generally inure to the benefit of the sovereign, unless he has made some other positive distribution of them. When any conquest of territory is made the inhabitants immediately pass under the dominion of the conqueror, and are subject to such laws as he chooses to impose upon them. In cases of reconquest the property, unless previously disposed of, returns to the original owner by the *jus postliminii*, in like manner as the restoration of a prisoner of war to his own country reinstates him in his prior rights. 7. There are also certain rights which war confers on the belligerents in respect to neutrals. Thus they have a right to blockade the ports or besiege the cities of their enemies, and to interdict all trade by neutrals with them. But the blockade must not be a mere 'paper blockade;' no blockade is to be recognized unless 'the besieging force can apply its power to every point in the blockaded state.' They have a right also to insist that neutrals shall conduct themselves with good faith, and abstain from all interference in the contest by supplying their enemy with things contraband of war. And hence arises the incidental right of search of ships on the high seas for the detection of contraband goods. At the Congress of Paris, 1856, the ambassadors of Great Britain, France, Russia, Austria, Prussia, Turkey, and Sardinia agreed to a joint declaration by which several elements in the laws of war, as then understood, were modified. But the United States of America refused to accede to them, objecting especially to the article by which privateering was declared to be abolished.

The next question is the consideration of the rights and duties of neutrals. A neutral nation is bound to

observe entire impartiality between the belligerents. It should do nothing, therefore, which favours one party at the expense of the other. Neutral nations are, strictly speaking, bound to compel their subjects to abstain from every interference in the war, as by carrying contraband goods, serving in the hostile army, furnishing supplies, &c. In practice, however, in cases of contraband goods, the belligerents content themselves with exercising the right of confiscation; and the neutral nation submits to this as a just and fit remedy, without any complaint. Subject to the exceptions above referred to, a neutral has a right to insist upon carrying on its ordinary commerce with each of the belligerents, in the same manner as it had been accustomed to do in times of peace. Whether it may carry on a trade with either belligerent in war, which is interdicted in peace, is a point which has given rise to very sharp controversy in modern times, and especially between Britain and America, the former contending for the restriction to the accustomed trade, the latter insisting upon also carrying on the unaccustomed trade. Whether a neutral nation is bound to allow a passage to the troops of either belligerent through its own territory, is a point often discussed. Strictly speaking, neither party has a right to insist on such a passage; and if it is granted to either, and materially affects the fortune of the war, it is almost always construed as an act of hostility to the other party, and is resented accordingly. A neutral nation has also a right to insist that no hostilities shall be committed by the belligerents within its territorial limits. The property of an enemy, found on board a neutral ship on the high seas, is deemed good prize, and *e converso* the property of a neutral, found on board of an enemy's ship, is deemed neutral. The reason for the difference is, that upon land the neutral sovereign has exclusive jurisdiction, within his own territory, over all persons and property within it. But all nations have a common jurisdiction on the high seas to enforce their rights, and the right of search carries with it an incidental jurisdiction over all enemy's property found therein, in the ships of a neutral. This right of search, however, is strictly confined to merchant ships, and is never extended to ships of war belonging to the nation itself; for in such ships the national sovereignty is exclusive. In cases of civil war the rights and duties of neutrals are not essentially different. Every neutral is bound to abstain from all active interference in the contest, on one side or the other. If the contest gives rise to the establishment of independent governments, formed out of the severance of the old empire, it is not deemed an act of hostility to recognize each as having a sovereign existence as a nation. But while the contest is dubious, and the affair wears the appearance of a mere private rebellion, such a recognition would be deemed an active interference to promote the civil war, and therefore would, or at least might, be resented as a departure from the neutral character. Hitherto we have dealt with the law of nations; but there is a division of international law, generally known as the 'conflict of laws,' which takes cognizance of the principles which should regulate the rights and obligations of private parties when these are affected by the separate internal codes of distinct nations. Mr. Justice Story, an American judge, in 1834 published his famous treatise on this subject, in which he had methodized the results arrived at by foreign jurists. His book is still the standard authority in the United Kingdom. It treats of the 'conflict of laws, foreign and domestic, in regard to contracts, rights, and remedies; and especially in regard to marriages, divorces, wills, successions, and judgments.' The leading principle of international law in this department is, that each nation should give effect to the laws of another country, unless these conflict with its own laws, or with the general principles of justice.

NATIVITY, in astrology, the theme or figure of the heavens, and particularly of the twelve houses, at the moment when a person was born, supposed to indicate his future destinies, and synonymous with *horoscope*. See HOROSCOPE and ASTROLOGY.

NATOLIA, or ANATOLIA (Greek, *Anatolé*, the East or Levant; Turkish, *Anadoli*), the peninsular-shaped western extremity of Asia, identical with Asia Minor. It is divided into eight eyalets, or governments, namely: 1. Khodavendighiar; chief town, Brussa. 2. Kastamoni; chief town, Kastamoni. 3. Tarabosan, or Trabezun; chief town, Trebizond. 4. Ismir, or Aïden; chief town, Smyrna. 5. Karaman; chief town, Konia. 6. Adana; chief town, Adana. 7. Bozuk; chief town, Angora. 8. Sivas; chief town, Sivas. The area is supposed to be about 270,000 square miles. The surface, which is extremely irregular, is an elevated plateau, supporting still higher elevations, dotted with salt lakes, and inclosed by the Taurus and the Anti-Taurus, running east and west, not far from the shores of the Levant and Black Sea respectively. Between these two main ranges there are many smaller ones, some of which attain a great elevation. The volcanic peak of Agridagh is 18,000 feet high above the plain of Kaisarieh, itself having an elevation of between 2000 and 3000 feet, and there are other elevations of from 7000 to 10,000 feet. The great number of salt and fresh water lakes is the most remarkable geographical feature of this region. The rivers are the Kizil-Irmak (*Halys*) and the Sakaria (*Sangarius*), flowing into the Black Sea; and the Sarabat (*Hermus*) and Meinder (*Mœander*) into the Ægean. The climate, so much lauded by the ancients, admits of no general description, owing to the diversity in the elevations of its surface, which presents winter and summer within one day's journey. The western shores are justly celebrated for their genial warmth, as well as the coast facing the Black Sea. The elevated plains of the interior are extremely cold in winter, and the cold on the passes of the Taurus is intense. Karaman is oppressively hot in summer. The northern slope of the central plateau so abounds with forests of oaks, beeches, planes, ashes, and other species of building timber, that the Turks have called one of its forests the 'Sea of Trees.' On the coast are entire woods of the finest kinds of fruit-trees, among them the cherry-tree, to the celebrity of which the ancient *Cerasus*, now Keresoum, owes its name. Natolia has few large beasts of prey, except a species of panther, called *Kaplan* by the Turks. In the less frequented regions jackals are common, and there are a few bears, wolves, and wild hogs. Buffaloes are used for draught, and the camel for the transport trade. The Osmanli Turks form about nine-tenths of the population; they are not only the original branch of the Turkish family, but also the largest and most civilized, nor have they varied to any considerable extent from the primitive type. About one-twentieth part are Greeks, the rest are Jews, Armenians, Kurds, and some few Zingari, or gipsies. The whole population is supposed not to exceed 5,000,000. Their virtues are cleanliness, courteousness, honesty, sincerity, and contentment; but they are said to be avaricious and artful, which seems hardly compatible with these virtues. The political and social arrangements are almost identical with those of the other parts of Turkey. The old Turkish system of vassal-dynasties still exists here, resembling the feudal system of Europe during the middle ages. The Derebegs, or valley-chiefs, are hereditary rulers and military commanders under the suzerainty of the Porte.

NATRIUM. See SODIUM.

NATROCALCITE is an impure calcium carbonate, containing about 94 per cent. of this substance, admixed with alumina and ferric oxide, calcium sulphate, clay and water; it occurs at Sangershausen in pseudomorphous form after Gay-Lussite.

NATROLITE. This mineral is a hydrated silicate of sodium and aluminium; the formula $Na_2O.Al_2O_3.3SiO_2.2H_2O$ represents its general composition. In some specimens the alumina is partly replaced by ferric oxide, and the soda by ferrous and manganous oxides. Natrolite generally forms trimetric prisms with pyramidal summits; specific gravity 2·17—2·24; its colour varies from gray to yellow, and sometimes to red or pale green. The localities where this mineral is found are very various, among others may be mentioned the Tyrol, Auvergne, Sicily, and Norway.

NATTER-JACK TOAD (*Bufo Calamita*), one of the two species of Toads (Bufonidæ) found in Britain, the other species being the Common Toad (*B. vulgaris*). The name 'Natter-Jack' is said to be of Lincolnshire origin, but its exact origin or significance is unknown. This species is of smaller size than the common toad, and, unlike the latter, the natter-jack is found in Ireland, the exorcism of St. Patrick having apparently overlooked this species. The general colour is lightish-brown, spotted with patches of a darker hue. A line or streak of yellowish tint passes down the middle line of the back. It is lively and agile in its movements; and is frequently found inhabiting dry, sterile tracts. In most districts its distribution is of a local or limited nature. The natter-jack possesses largely developed cutaneous or skin-glands on the upper aspect of the leg. The secretion of these glands is of an acrid nature, although the popular idea of any actually poisonous properties of the secretions of the toads is entirely erroneous.

NATURAL HISTORY. The significance of this term is so varied that it has become exceedingly desirable to clearly understand and define the exact meaning which is to be attached to the name. Thus by the term 'Natural History' one person may mean to indicate the science of zoology; another understands that the name applies collectively to the sciences of botany and zoology; whilst a third may argue that natural history, as a history of nature in its true and wider sense, should comprehend not only zoology and botany, or the sciences of living beings, but those sciences also which deal with the *inorganic* or lifeless objects of this world. In this latter sense, which appears to us to be that most consistent with the requirements of science and with the true meaning of the term, natural history will include (1) *biology*, or the science of living beings—that is, *zoology* (animals) and *botany* (plants); (2) *chemistry;* (3) *natural philosophy*, or physics; and (4) *geology* and *mineralogy*, including *palæontology*, or the science of fossils. These branches in themselves comprehend most if not all the sources of inquiry from which we may derive all necessary information concerning the world itself and the living beings which reside in or upon it. The science of biology, or that dealing with living beings, necessarily includes within its scope and limits all the branches of inquiry which have for their object the investigation of animal and vegetable structures and functions. Thus anatomy, physiology, development, taxonomy or classification, distribution, &c., are the chief subdivisions of biology, whether applied with reference to animals or plants or to both. And the remaining branches of natural history science stand intimately related to these subdivisions, and as serving to connect them with other and less nearly related sciences. Chemistry thus deals with the structure of living as well as of inorganic bodies, and is intimately associated with physiology or the science of living functions. Through geology and mineralogy we reach the department of palæontology, or the record of life in past epochs of the globe as revealed in the history of *fossil* organisms. And through natural philosophy we determine the agencies, influences, and conditions to which living bodies as well as inorganic bodies are subjected and under which they exist in reference to the media in which they are situated. Thus the correlation of the physical forces, such as heat, light, electricity, &c., with the vital forces or actions observed in living beings, can only be studied through the combined knowledge of the physicist and physiologist. And similarly the laws of motion, as applied to animal movements and mechanism, can only receive their full explanation from the united knowledge of the natural philosopher and anatomist. In the present day, therefore, the science of natural history bids fair to become emphatically the science of the future. Involving as it does in its aims questions concerning the origin of even man himself, and which affect the social and religious ideas of every civilized state and community, natural history knowledge cannot but be regarded as one of the most elevating and important studies in which the human mind may engage. And so great are the requirements which this study demands that at the present we find the specialization of branches of natural history science to be carried out to a very high degree. This specialization by naturalists of different or particular branches of study, and the devotion of the energies of each to the cultivation of one special department, is simply the result of the immense extent and range of the subject and of the impossibility of any one mind taking up all the varied departments of study. Each worker in the present day therefore assiduously cultivates his own corner of the one great field of inquiry, and in this way the rapid spread of investigation is urged on throughout the entire area by the exertions of countless individual workers. The history of zoological science will be given under the article ZOOLOGY; and articles on the progress of natural philosophy and chemical science, &c., will be found under their respective headings.

NATURALIZATION. See ALIENS.

NATURAL PHILOSOPHY. See PHYSICS.

NATURAL SELECTION. This phrase, so frequently employed in connection with Mr. Darwin's theory of the 'origin of species,' indicates the process by which nature is believed to pick out or 'select' those individuals of the species which will tend, before the other members of the species, to perpetuate variations from the normal specific type. Mr. Darwin's theory takes origin from the fact that all species *vary* to a greater or less extent. These variations, through particular or 'selected' members of the species, become perpetuated. What was at first a mere individual variation becomes in this way and through transmission a perpetuated 'variety' or a 'race.' These 'races' are subject to a similar process of variation, and varieties of the race may in turn appear; and thus through the variety we in time arrive at forms which present characters so widely different from those of the original species that they may be regarded structurally and functionally as new 'species.' Species, in this view, are evolved by variation from pre-existing species. And Mr. Darwin holds that nature favours this variation, and that she 'selects' the varying members of a species to perpetuate and in time to evolve the variations into characters of a new and *specific* type. This process of natural selection is artificially imitated by man when he selects certain members of a race or breed of cattle, for example, with the view of producing progeny which will possess certain marked characters derived from

the 'selected' parents. And in the domestication and breeding of cattle and sheep, in the numerous varieties of dogs, pigeons, and other animals, man, through artificial selection, has imitated nature in her process, and has produced varieties or breeds which differ widely from the original stock or specific type. The expression 'struggle for existence,' first used by Mr. Herbert Spencer, has also been closely associated with the phrase 'natural selection.' The 'struggle for existence' indicates the conditions under which the principle of natural selection operates. There are more animals and plants produced, says Mr. Darwin, 'than can possibly survive;' and 'there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life. It is the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms, for in this case there can be no artificial increase of food and no prudential restraint from marriage. Although some species may be now increasing more or less rapidly in numbers, all cannot do so, for the world would not hold them.' In this struggle for food, &c., and for the necessary conditions of existence, the favoured individuals who will come off best in the struggle are the *selected* (that is, the 'varying') members of a species, and in due course the wave of variation, once set in motion, soon becomes an irresistible tide, which, according to Darwin, sweeps further and further away from its starting-point in the original stock or species. The theory of 'sexual selection' latterly enunciated as an adjunct to that of natural selection proceeds on the assumption that sexual instincts operate powerfully to induce the selective process. The male animals of a species which possess special peculiarities or advantages in size, colour, form, or in other points, will be selected as the future progenitors of the species over those which want such distinguishing features. The stronger males may of themselves 'select' or even fight for and gain possession of the females, whilst the females, on the other hand, may 'select' the most 'brilliant' males. Objections against the theory of natural selection of a more or less potent kind have been and are continually being made. These, together with the subject of 'species' and its variations, will be dealt with in the article SPECIES. It will be sufficient in the present instance to remark that, viewing the theory as yet merely as a hypothesis and as a provisional explanation of variation which the future progress of science will tend either to confirm or condemn, the chief objection against its tenets is that involved in the idea that the 'variations' in a species, so far from tending to the preservation of the individuals which possess them, may operate towards the destruction of such marked members. And among the lower forms of animal life, destitute of senses qualifying them for the appreciation of colour, &c., the principle of 'sexual selection' cannot be conceived to operate at all.

NATURAL THEOLOGY is that department of ethics which deals with those propositions relating to the existence and attributes of God and the duty of man which can be demonstrated by human reason, independent of written revelation. In this sense natural theology is by some regarded as the foundation of the Christian revelation, and is believed to furnish evidences warranting the belief in a Being of infinite power, wisdom, goodness, and justice. Others, however, maintain that a science of natural theology is chimerical, and that a logical demonstration of the existence of Deity from an examination of the constitution of nature is impossible. There has been an unreasonable jealousy of natural religion evinced by the advocates of revealed religion; yet Lord Bacon describes natural religion as the key of the revealed, an opinion endorsed by Newton, and Locke and Tillotson are at one as to its importance in the system of ethics. The standard English work on the subject is Paley's Natural Theology (London, 1802). A cheap edition of Paley's work, illustrated by Lord Brougham and Sir Charles Bell, in four vols. 48mo, was published at London in 1853. The Bridgewater and Burnett Treatises are contributions to the literature of this science.

NATURE, a word of extensive and various signification. In its most extensive meaning it denotes the world, the universe, the creation; hence it comprises both the physical world and the spiritual, as both are created. Those philosophers, ancient and modern, who consider God as inseparably connected with the universe, to which his animating breath gives life, include even him under the idea of nature. In fact, they have not unfrequently confounded God with the laws and principles of nature. (Cicero, De Naturâ Deorum, lib. i. c. 8, and lib. ii. c. 22 and 32.) But the Christian expresses by *nature*, in its most extensive meaning, the *universe*, as contradistinguished from *God*, the Creator. In another application of the word *nature* is contradistinguished from *art*, and signifies everything which is not artificial, not purposely produced or practised with reference to rules of art. In this sense we speak of a *natural* poet, or artist, products of *nature*, &c. It must be observed here, that in many cases it is very difficult to draw the exact limit between nature and art. *Natural* is also used in contradistinction to *taught*, or *communicated;* thus we speak of *natural powers*, in contradistinction to the ability acquired by education; and *natural religion*, or that which man is supposed to acquire from observation of himself and the creation around him, in contradistinction to *positive religion*, or such as is revealed and established by special circumstances. In the narrowest sense, *nature* means the peculiar character of the various objects of nature in its widest sense, as given above. In this application it is often used for character only, and we even speak of the 'nature of God.' In reference to men, *nature* is very frequently used for the physical constitution and moral disposition of an individual. In theology the word *nature* is often used; thus men speak of the 'divine and human natures of Christ,' of the 'natural state of man,' &c.

In the fine arts *nature* often means the successful imitation of nature; but with artists of a higher order *nature* does not signify a mere copy, but, as it were, the expression of the ideal of nature, at which she aims in all her formations, yet without reaching it.

NATURE PRINTING is the art of giving an exact reproduction of natural objects by printing from impressions of the objects themselves formed by pressure on metallic plates. The print is so truthful that the microscope can detect peculiarities in it minute enough to defy imitation on the part of the engraver. Some dispute has arisen as to the original inventor of the art, but to M. Alois Auer, superintendent of the imperial printing-office in Vienna, is due the credit of having first successfully practised it, and of having published the process. It was introduced into Great Britain by the late Mr. Henry Bradbury, of the firm of Bradbury and Evans, London, who had made nature-printing a special study, and who had been a student at the imperial printing-office of Vienna when Auer produced his first specimens. The only objects to which the art can be applied with success are those with tolerably flat surfaces, such as dried and pressed plants, embroidery and lace, the grain of wood, &c. The subject to be

printed is first thoroughly dried by pressure, though the services of the sun, and even of artificial heat, are occasionally called into requisition. Upon a lead plate, planed as bright and even as a looking-glass, the subject is placed in the required position, and is then passed between powerful rollers, until it is embedded in the lead, producing a most beautiful and perfect impression. If numerous impressions are wanted, the softness of the lead renders a further process necessary, and a facsimile of it is obtained in copper by the electrotype process. The printer inks the copper-plate in such a manner as to represent nature as nearly as possible, the leaves being coloured green, for instance, and the stems and roots brown. The impression produced is in low relief. Several magnificent works of this description have been produced at Vienna. The Ferns of Great Britain and Ireland, with Text by Lindley and Moore, British Sea-weeds, and Trees of Great Britain, all possess a high degree of excellence as works of art, and are of indisputable correctness.

NAUMACHIA (from the Greek *naus*, a ship, and *machē*, a fight), among the Romans a public spectacle, representing a naval action. Cæsar was the first who exhibited a spectacle of this sort, which soon became the favourite amusement of the Roman people. The *circus maximus*, in which they were at first represented, being found inconvenient, buildings were erected by the emperors, specially adapted for the purpose: these edifices were likewise called *naumachiæ*. They resembled the amphitheatres, and like them, were at first built of wood. Domitian appears to have been the first who erected one of stone. A *naumachia*, built by Augustus, was 1800 feet long and 200 wide, and was capable of containing fifty ships with three banks of oars, besides many small vessels. They were suddenly laid under water by means of subterraneous canals, so that the ships were raised at once from the dry floor before the eyes of the spectators. The water was usually brought from the Tiber, near which the *naumachiæ* were for the most part built, but sometimes from aqueducts. These sea-fights were exhibited with the same splendour and reckless disregard of human life which characterized the gladiatoral combats. Sea-monsters swam about in Nero's *naumachia*. Titus exhibited a sea-fight, in which 3000 men were engaged, and ships almost equal in number to two real fleets were shown in combat by Domitian. The opposing fleets assumed the names of different maritime nations, as Persians and Athenians, &c. The *naumachiarii*, or persons who fought in these exhibitions, were gladiators, slaves, criminals, captives, &c., who were doomed to die, unless they were saved by the interposition of the people, or by the clemency of the emperor.

NAUMANN, JOHN GOTTLIEB, or AMADEUS, one of the greatest composers, chapel-master to the elector of Saxony, at Dresden, was born at Blasewitz, near that city, in 1741. His father was a peasant, who, perceiving his son's talent for music, permitted him to go every day to school in Dresden. A member of the chapel at Stockholm named Weestrum, having been led by chance into the house of his father, was astonished to find some difficult pieces of music lying on the harpsichord, and offered to take the boy, then thirteen years old, to Italy. The offer was accepted with reluctance. The boy was obliged to perform the most menial services for his master. He followed him on foot to Hamburg, and thence in 1758 to Italy, where he was obliged to earn his own subsistence by copying music, and to cook for his master. He finally obtained admission into the number of Tartini's pupils in Padua, and soon after found a kinder master. He remained for three years in Padua, and then went to Naples, where his taste for theatrical music was awakened. On the recommendation of Tartini he had studied counterpoint at Rome under Martini. He settled in Venice, where he gave lessons and composed some theatrical pieces. After a residence of eight years in Italy he was called to Dresden, where he was appointed in 1765, a composer to the elector. He soon after, with the consent of the elector, made a second journey to Italy, residing chiefly at Naples, where he composed two operas. In 1769 he returned to Dresden, in order to compose the great opera La Clemenza di Tito, for the marriage of the elector. In 1772 he made a third journey to Italy, where he composed within thirteen months, five operas, after which the elector appointed him his chapel-master. He composed for the theatre of Stockholm his Amphion, Cora, and Gustavus Vasa, and for the Danish court his Orpheus. Among his best operas are Tutto per Amore, and La Dama Soldato. In later years church music became his favourite occupation, though he brought out his Acis and Galatea as late as 1801. He died October 23 of that year, from an apoplectic stroke. He left a number of sacred compositions, as the Pater Noster, seven psalms, twenty-eight masses, oratorios, vespers, &c. Naumann was also a great performer on the harmonica, for which he composed six sonatas. His reputation was so high that the King of Prussia made him magnificent offers to become his chapel-master, which were refused.

NAUMANNITE is the name given to a native selenide of silver and lead found in the Hartz. This mineral contains about 26 per cent. of selenium, 65 per cent. of silver, and 6 per cent. of lead; in some samples a great part of the silver is replaced by lead. Specific gravity about 8·0. Colour and streak iron-black.

NAUMBURG, a town of Prussia, province of Saxony, in the government and 18 miles S.S.W. of Merseburg, beautifully situated in the valley of the Saale, in an amphitheatre of hills, covered with gardens and vineyards. The town is surrounded by walls. The principal buildings are five churches, one a cathedral, partly Gothic and partly Romanesque, with lofty towers and a double choir, completed in 1249; while two of the others deserve notice from the statues and pictures which adorn them; a town-house, gymnasium, industrial school, and two hospitals. The manufactures consist of combs, carriages, playing-cards, woollen cloth, hosiery, and leather; the trade is in these articles, and in oil, wine, wool, horse-hair, and feathers. In memory of the termination of the Hussite siege in 1432 an annual festival, the Kirschenfest, is celebrated here on the 28th of July. Pop. (1880), 17,868.

NAUPACTUS. See LEPANTO.

NAUPLIA, or NAUPLION. See NAPOLI DI ROMANIA.

NAUPLIUS. This term was applied by O. F. Müller to the larval or first stage in development of the lower Crustacean orders. The naupliiform larva was thus described as possessing an unsegmented body, oval in shape, and as being provided with a single median eye. No carapace or hard investing dorsal shell or exoskeleton exists in such a larva. In the present state of terminology of lower Crustacean development the above characters still serve to designate the larval form known as the Nauplius, but the term has also been more widely applied than by Müller himself. In the order Epizoa of the Crustacean class we find examples of the Nauplius larva as in *Achtheres* (which infests the perch), and from this larval form a more advanced embryo is in the due course of development liberated. In the Rhizocephala, the members of which group exist parasitically upon crabs, the larva is similarly naupliiform,

but possess a dorsal shell or carapace. In the Cirripedia or Barnacle order the young first appears as a 'Nauplius,' and also possesses a carapace. This larva, through a process of moulting, gives origin to the next stage. The Nauplius-larva of the Barnacles, &c., possesses a pear-shaped body, terminating in a long tail of forked appearance. Among the Entomostraca Nauplius larvæ are developed. As in *Cyclops*, a common 'water-flea,' the young first appear to possess a rounded body and four legs. After the lapse of a fortnight another pair of legs appear, and in this condition Müller himself termed them Nauplii. After moulting twice or thrice, the form of the adult is attained. The study of these developmental stages has more than any other series of investigations tended to show how closely related are the various orders of lower Crustacea when viewed from an embryological standpoint. Indeed the study of Crustacean development has done more than anything else to reconcile the varied and different forms included in that great Annulose class. See also LERNÆA.

NAUSEA (Greek, *nausia*, qualmishness, from *naus*, a ship), the sensation of sickness, or inclination to vomit, similar to that produced by the motion of a ship at sea. Though the feeling is referred to the stomach, it frequently originates in disorder of other and remote parts of the body, especially of the brain, where it is believed that the sensation of sea-sickness is primarily excited.

NAUTICAL ALMANAC. See ALMANAC (NAUTICAL).

NAUTILUS, a genus of Cuttle-fishes or *Cephalopodous* Mollusca, represented by a single *living* example, the Pearly Nautilus of the naturalist (*Nautilus Pompilius*), and by several extinct or fossil species. The Pearly Nautilus is a Tetrabranchiate or 'four-gilled' Cephalopod, and is to be carefully distinguished from the *Paper* Nautilus, or Argonaut, also one of the Cuttle-fishes, but of essentially distinct and different structure. In addition to the number of gills the Nautilus possesses several other highly distinctive characters. It is thus the only member of the Cuttle-fish class in which a true external chambered shell exists. The Paper Nautilus, or *Argonauta Argo*, a 'two-gilled' or Dibranchiate Cuttle-fish, possesses an outside shell, but this is not a true shell, inasmuch as it is secreted by two of the 'arms,' and not by the 'mantle' (which see); and it is further undivided, and serves merely as a receptacle for the ova or eggs of the female, by which alone it is secreted. Then also in the pearly nautilus no ink-sac exists; the arms are numerous, and unprovided with suckers; and the 'funnel' or 'infundibulum,' through which the effete water used in respiration is ejected, does not form a complete tube. The shell is discoid, involuted, and symmetrical; and a vertical median section shows it to be divided by a series of curved septa or partitions into a number of chambers, which increase in size from the inner to the outer spires of the shell—the largest and last-formed chamber being that at the mouth of the shell, occupied by the body of the animal. Each chamber of the shell is formed successively by the animal, which retires from the preceding chamber, as that compartment becomes insufficient to accommodate the increasing growth of its body. As the Nautilus leaves each chamber of the shell it secretes behind it a partition or septum, which forms as it were the back or posterior wall of the new cavity. The many and unused chambers of the domicile are kept in communication with the living tenant by means of a fleshy membranous tube, or 'siphuncle,' which proceeds from the 'pericardium' or investing sac of the heart, and is continued through the chambers of the shell, piercing the septa or partitions at their centres. This chambered arrangement of the shell, and the presence of this siphuncle, have long formed subjects of discussion among naturalists, with particular reference to the uses or functions of the arrangement. By most authorities it is maintained that the whole partakes of the nature of a hydrostatic apparatus, inasmuch as, through the admission of water or gas to the chambers of the shell, the specific gravity of the animal may be altered, so as to enable it to rise or sink in the water. The function of the siphuncle has been alleged to be that of maintaining a low degree of vitality throughout the unused portions of the shell, but it may be reasonably doubted whether this statement includes its entire functions. The prevailing idea appears to be that of supposing that the nautilus fills the chamber of the shell with water, and that through thus rendering the body heavier as compared with the density of the surrounding medium, the animal may sink, whilst the ejection of the water would insure its rising to the surface of the sea. The pearly nautilus is thus truly able to rise to the surface of the water, whereas the paper nautilus, so frequently treated of in poetical legends, is unable in this way to rise and sink, or to swim, as alleged, by means of its expanded shell-secreting arms used as sails. The body of the pearly nautilus is divisible into a front region or *prosoma*, which includes the head, and the *metasoma* or posterior region, which comprises the viscera and general organs of the body. The head can be protruded from or retracted within the body chamber of the shell. The 'mantle' lines the chambers of the shell, as in other Mollusca, and forms a thickened front-fold or collar, which envelopes and surrounds the head and arms. The latter partake more of the nature of tentacles or organs of touch than in the other Cephalopods, in which they are provided with suckers, and adapted more especially for prehensile purposes. A set of fleshy processes (*labial tentacles*) fringe the aperture of the mouth, which opens in the centre of the arms and on the upper aspect of the head. The mouth possesses a masticatory apparatus in the form of two mandibles or jaws, which are calcareous at the tips; and a tongue also exists provided with recurved teeth or spines at its posterior portion. A crop and gizzard are developed, and the intestine opens into the funnel, which is formed of two halves placed in apposition. In other Cephalopoda the funnel is a complete muscular tube. A large liver and salivary glands are present, and a renal or kidney apparatus is represented. The four gills are disposed two on each side of the body, and the effete water used in breathing is ejected from the funnel, and made use of, as in other Cephalopods, as a means of locomotion, the animal being propelled backwards through the reaction of the *jet d'eau* against the surrounding medium. The systemic heart is inclosed within a membranous sac named the *pericardium*, into which, as already remarked, the sipuncle which traverses the chambers of the shell opens. The nervous system consists of large cerebral and infra-œsophageal ganglia, which are inclosed within a cartilaginous case representing a primitive or rudimentary skull. From these chief nervous centres nerves originate to supply the viscera and body generally. The senses are represented by prominent eyes, by tentacles subserving touch, by labial tentacula, and the soft anterior portion of the tongue, probably adapted to exercise the gustatory sense; and by certain membranous laminæ, placed at the entrance to the mouth, and which are believed to be olfactory organs. No distinct organ of hearing exists in the Nautilus, although in other or Dibranchiate Cuttle-fishes auditory capsules exist. The female reproductive organs of the Nautilus comprise an ovary, with an oviduct terminating at the base of the funnel, and 'nidamental glands,' the function of

which is to invest the eggs with the outer or protective envelopes, known as 'nidamental capsules.' Our knowledge of the Nautilus is derived chiefly from Professor Owen's account of his dissection of a single perfect specimen. Van der Hoeven and Peters have also examined specimens, but our knowledge of the structure of this solitary representative of the Tetrabranchiates cannot yet be said to be nearly perfect or complete, although specimens are now beginning to be more frequently obtained than in former years. The Nautilus order, or that of the Four-gilled Cuttle-fishes, although so sparsely represented in existing seas, have yet a geological history and a past distribution of exceeding interest and vast extent. The Four-gilled or Tetrabranchiate Cuttle-fishes with their external shells, many of which were of curious and elegant form (for example, Ammonites, Ceratites, Baculites, Orthoceras, Turrilites, Scaphites, Aneyloceras, &c.), first appear as fossil organisms in the lower Silurian, if not in the upper Cambrian rocks of the Palæozoic epoch. In these rocks, containing thus the earliest representatives of the Cuttle-fish group, we find the Nautilus genus itself represented, and this genus continues to occur in all the formations from the Silurian to the present day. The various species of Nautili have gradually become exterminated, until in the present day the single *N. Pompilius* is left to represent in itself as a living form the abundance of Tetrabranchiate life in the past. The Tetrabranchiate Cuttle-fishes, viewed collectively, attained their maximum of development in the Palæozoic epoch, although the number of *types* was greatest in the Mesozoic epoch. But as this last period passed away the Tetrabranchiates, with the single exception of the Nautilus genus, died out, and in the Kainozoic or Tertiary period the Nautilus genus alone occurs in a fossil state. All the *Nautilidæ*, including the existing Nautilus, are distinguished by the simple unindented conformation of the *sutures* of the shell—the sutures being the edges of the septa or shell partitions, where they appear on the external surface of the shell. The siphuncle is simple, and pierces the septa centrally, sub-centrally, or near the concavity of those shells which are curved. For further details see CEPHALOPODA, CUTTLE-FISHES, MOLLUSCA, MANTLE, &c. (Pl. CXXVIII.-CXXIX. fig. 26.)

NAUVOO, a town of the United States of America, Hancock county, Illinois, once a Mormon settlement, with a population in 1846 of 15,000. In 1880 the population was only 1402.

NAVAL CADETS are boys in training for service as naval officers. They enter the service between twelve and fourteen years of age, after passing an examination in elementary education. After two years' service they are promoted to the rank of midshipman with a daily pay of one shilling.

NAVAL COURTS. By the Merchant Shipping Act 1854, any officer in command of a queen's ship, and failing him any consul, may summon a naval court in the following cases when a complaint is made by a master, mate, or seaman of a British ship which appears to demand immediate investigation: when the interest of the owner of a British ship or of her cargo may seem to require it; when a British ship is wrecked or abandoned. The court is to consist of not less than three nor more than five members, of which one shall, if possible, be an officer in the royal navy not below the rank of lieutenant, one a consul, one a master of a British ship other than the ship which is the subject of inquiry, the rest to be British masters or merchants; the officer of highest rank to be president. Such courts to supersede the master, discharge seamen, forfeit or decide disputes as to wages, send home offenders, order payment of costs, &c. The orders of the court are to be entered in the official log of the vessel concerned, signed by the president. A report of the proceedings is to be sent to the board of trade. A penalty of £50, or twelve weeks' imprisonment, may be imposed on any one preventing complaint or obstructing the proceedings of the courts. Offences committed by British seamen at foreign ports are also by the Merchant Shipping Act placed within the jurisdiction of the court of admiralty. By 18 and 19 Victoria (1855), cap. xci. s. 18, naval courts constituted as above are authorized to try all offences under the Merchant Shipping Act which may be tried summarily by two justices, and to inflict the same penalty. Sentence of imprisonment must be confirmed by the senior naval officer present at the place and the place of imprisonment approved of by him. By act 29 and 30 Victoria (1866), cap. cix., by which the government of the royal navy is regulated, commanders-in-chief are empowered to call courts-martial consisting of commanders and captains. When three or more ships meet in a foreign station the senior officer may hold a court-martial and preside. After trial begun no member may absent himself, except in case of sickness, under pain of being cashiered.

NAVAL RESERVE. By the act 22 and 23 Victoria (1859), cap. xl., the admiralty is empowered to raise a force of Royal Naval Volunteers not exceeding 30,000 men. The term of service is for five years. Volunteers are trained twenty-eight days each year, whether on shore or at sea. The queen may, after communication to Parliament, or by proclamation of council during the recess, call volunteers into active service. Volunteers are bound to serve three years at sea if required, and the term may be prolonged for two years more by proclamation on emergency. During the extended period of service volunteers are to receive 2*d.* per day extra pay. When on service on shore volunteers receive a money allowance as fixed by the admiralty, the same pay as in the navy, and an allowance for travelling expenses. By act 24 and 25 Victoria (1861), cap. xxix., the queen is empowered to accept the services of officers of the merchant service as officers of reserve to the royal navy. The men of the reserve receive a retaining fee of £3 a year, besides the ordinary pay of the navy when on service. After the age of forty-five they become entitled to a pension of £12 for life, or to a smaller sum with continuation during the life of the pensioner's wife. The officers receive, while training, 10*s.* a day for lieutenants, and 7*s.* for sub-lieutenants, with allowances for casualties in service at the same rate as in the royal navy.

NAVAN, a market town of Ireland, county of Meath, agreeably situated on an acclivity at the junction of the Boyne and Blackwater, 36 miles north-west of Dublin, on the railway and canal to Drogheda. It is indifferently built. It has a distillery, brewery, pepper, flour, and flax mills; a considerable and increasing trade in corn, and two weekly markets. Adjoining the town is the splendid ruin of Athlumney Castle. Pop. (1881), 3873.

NAVARINO, a fortified seaport town of Greece, on the south-west coast of the Morea. It is divided into an upper and a lower town; and is surrounded by a wall, without any fosse or ditch. The citadel or upper part is on an eminence, but has no rampart, nor any outworks. The houses near the harbour are tolerably well built; the streets narrow, steep, uneven, and dirty. The harbour is one of the best in the Morea, having the long narrow Island of Sphagia in front, which extends in a south-west direction for nearly 3 miles. The principal entrance is to the south of the island, the passage being nearly 1 mile broad, but when in, the harbour widens to 2 miles;

and its general depths, with exception of two shoal spots, are 26 to 12 fathoms. Here the British, French, and Russian fleets under Sir E. Codrington, gained a victory over the Turkish and Egyptian, October 20, 1827. The site of Navarino is near that of the ancient Pylos.

NAVARRE (Spanish, *Navarra*), a province of Spain, between Aragon, Old Castile, and Biscay, capital Pampeluna; bounded north by France, west by the province of Guipuzcoa and Alava, east by Saragossa, and south by Saragossa and Logroño; area, 2449 square miles. Its northern boundary is very mountainous, being composed of the western slopes of the Pyrenees, which by their numerous streams supply the Ebro and Bidassoa, its principal rivers. Notwithstanding its proximity to the Pyrenees, the climate is rather temperate, as well as healthy. As Navarre has both a lowland and highland district, it combines all the means of subsistence; the latter supplying fuel and timber for building, and the former, wheat, maize, good wines, especially those of Tudela and Peralta; oil, flax, hemp, and all sorts of leguminous plants, as well as abundant pastures for cattle of every description. It also possesses mines of iron, copper, and lead. In the northern portion of the province the Basque language is chiefly spoken. Pop. (31st December, 1877), 304,184.—The ancient Kingdom of Navarre comprised both the modern Spanish province, sometimes called Upper Navarre, and also French or Lower Navarre, separated from the former by the Pyrenees, and included in the ancient province of Béarn, now comprised in the departments of Basses Pyrénées, and Landes. The wild and broken glens of this region became the natural fastnesses of the ancient inhabitants when retiring before the Romans and Moors. They made common cause with the highlanders of Aragon, until about 842, when Inigo Arista was chosen king of Navarre at Pampeluna, while the national liberties were guaranteed by the celebrated *Fueros de Sobrarbe*. Navarre was annexed to Castile in 1512 by Ferdinand the Catholic, partly by force, and partly by fraud; Jean d'Albret, the rightful heir, being abandoned by his French allies, who profited by his ruin, as the territory was partitioned; Ferdinand seizing all south of the Pyrenees, while the north portion ultimately passed, with Henry IV., to the crown of France.

NAVE (from *navis*, a ship), in Gothic architecture, the body or outer part of the church, the part of the cross (in the form of which cathedrals are built) situated towards the west. See ARCHITECTURE.

NAVEL, or UMBILICUS, the aperture or passage in the *linea alba*, or middle line of the abdomen, which in the adult is normally closed, but which in the fœtus or embryo gives passage to the umbilical vessels. The cicatrization or healing of the navel, and the insertion into the skin of the fibrous remains of these vessels, produces the contracted and depressed appearance so familiar in the external aspect of the structure. The umbilicus presents a point in the abdominal walls of great strength. Scarpa in his work on Hernia remarks that the umbilical opening in the infant, 'two months after birth, and still more in the adult, is not only like the other natural openings of the abdomen, strengthened internally by the application of the peritoneum and of the cellular substance, and on the outside by the common integuments, but it is likewise plugged up in the centre by the three umbilical ligaments and by the urachus; these ligaments form a triangle, the apex of which is fixed in the cicatrix of the integuments of the umbilicus, the base in the liver, in the two ilio-lumbar regions, and in the fundus of the urinary bladder; by this triangle is formed a strong and elastic bridle, capable of itself alone of opposing a powerful resistance to the viscera attempting to open a passage through the aponeurotic ring of the umbilicus, which apparatus does not exist at the inguinal ring or femoral arch.'

In the fœtus, or before birth, the umbilical ring attains its largest proportions, and is normally filled up by the structures—umbilical vessels and urachus—which pass through it. And even in its open state, and when thus fully occupied, its power of resisting the protrusion of the abdominal viscera appears to be as effectively exercised as in its closed or adult state. In cases of congenital umbilical rupture or hernia, where the intestines protrude through the opening, physiologists are therefore inclined to believe that the lesion occurs at a very early period of fœtal life, and before the opening was fully occupied by the vessels. And where hernia occurs at the umbilicus in the adult—a rare condition of matters—the rupture takes place more readily in the neighbourhood of the umbilicus than through the navel-opening itself.

The *umbilical cord* or *navel-string* unites the afterbirth or *placenta* (which see) to the navel. It is a thick cord consisting of blood-vessels—the two umbilical arteries and the umbilical vein. In its earlier stages the navel-string is composed of the remains of the amniotic layer, of the umbilical vesicle and its duct, of the remains of the allantois and urachus, and of the umbilical blood-vessels. In its later stages the umbilical blood-vessels alone remain to form the bulk of the umbilical cord. The umbilical arteries return to the placenta the blood which has been circulating throughout the fœtal body, whilst the corresponding vein carries the maternal blood from the placenta to the embryo. At birth the vascular connection between the parent and child is severed by the division of the umbilical cord close to the navel, the placenta, with its attached portion of the cord, being expelled from the womb after the birth of the child. The cord is tied close to the navel, with the view of preventing hæmorrhage from the divided vessels; but in the lower animals, in which the cord is simply torn or bitten through by the mother, no bleeding appears to take place. The limited portion of cord left attached to the navel soon shrivels up and becomes absorbed in the child, and the umbilicus then assumes the puckered and contracted appearance belonging to adult existence.

NAVIES and NAVIGATION, HISTORY OF. The origin of the art of navigation is lost in antiquity, and the earliest accounts of it are mainly mythological. The story of the Argonauts in point of the time assigned to its occurrence, about a generation before the Trojan war, is among the earliest of Greek traditions. But long before this period navigation was practised by the Egyptians and the Phœnicians. The Egyptians are said to have carried on a trade with India by sea at a very remote period, but it appears to have been soon abandoned for an overland traffic. A mythical personage, Erythras, from whom the name Erythræan is derived, is said to have made himself master of the Red Sea, and excluded the Egyptians, allowing them only one vessel a year. A far more permanent and illustrious naval commerce was enjoyed by the Phœnicians. Their most ancient city Sidon was of an unknown antiquity. In the book of Genesis (x. 19) it is mentioned along with Gaza as forming the north and south borders of the Canaanites; and in Joshua xi. 8 it is referred to as being known at the time of the Israelitish occupation of Canaan as Great Sidon. Tyre, which is generally considered as being a colony from Sidon, was founded, according to Herodotus, who made special inquiries on the spot, about 2750 B.C. From the beginning of

the historic period Tyre was the chief city of the Phœnicians. The enterprise of the Phœnicians was, from their situation, specially directed to the sea, and they pushed their commerce on it with a spirit and daring, which, considering their opportunities, has never been surpassed. They began by carrying on a mutual exchange of commodities between Egypt and Assyria. Their traffic included piracy and dealings in slaves. Their ships at length penetrated as far as the Arabian Sea and the Persian Gulf on one hand, and on the other to the northern and western coasts of Africa, as far as Senegal, to Italy, Spain, France, and Britain. They formed colonies and factories in the principal seats of their foreign trade, and their naval traffic set in motion extensive lines of inland commerce, conducted by the caravans and traders of numerous nations. They are the first who are known to have steered by the observation of the stars, and who could thus venture out to sea. They ultimately adopted two distinct kinds of vessels: the *trireme* or ship of war, and the *gaulos* or merchant vessel, with a deep hold, adapted for stowage. The history of navigation is closely associated with that of national armaments, and we have thus early the indication of a national navy. In the time of Solomon, and subsequently, the kings of Israel and Judah made some attempts to emulate the Tyrians in opening up a foreign trade from their own ports, and they even appear to have secured the friendly assistance of their neighbours in the effort, a remarkable departure from the usual spirit of mercantile jealousy; but the Jews never succeeded in developing a national mercantile commerce, nor are the causes of their failure difficult to conjecture. It is probable that the Philistines were more successful, but no authentic record of their commerce remains. From a period earlier than authentic history, as indicated by the story of the Argonauts, the Greeks began to exhibit a spirit of naval enterprise, and as long as their independence remained the various states into which both the mainland and the islands of Greece, as well as their Asiatic colonies were divided, rivalled each other in planting colonies and pushing their commerce in all directions. These states had also their armaments, and fought fiercely with one another, as well as with their foreign foes. The Athenians, Corinthians, Rhodians, even single cities like Chalcis and Megara, became renowned for their naval strength, and naval battles play a conspicuous part in the history of Greece. In the Persian invasions of Greece the size and power of the Persian fleets also forms a notable circumstance, and the great battle of Salamis (B.C. 480), in which Themistocles defeated the fleet of Xerxes, was the turning-point of the last Persian invasion. The smallness of the Greek galleys, and the superior size and number of those of the enemy, render this battle remarkable. The details of the tactics employed in it, and even the position of the rival fleets, are still matters of critical disputation.

Among the Phœnician colonies arose one which in enterprise, ambition, and power eclipsed the parent state. Carthage, the rival of Rome, rose to her high rank among the nations of antiquity purely in virtue of her naval commerce. In her long struggle with Rome it was mainly the wealth acquired by commerce which enabled her to maintain the conflict. The Carthaginians also stimulated the Romans to enter upon naval enterprise. A Carthaginian vessel which had been cast on the coast of Italy furnished the model for their first fleet, which consisted of 100 quinqueremes and twenty triremes. This fleet is said to have been built in sixty days. Duilius, who commanded it, wisely distrusting the seamanship of his improvised sailors, contrived a means of approximating his first contest with the Carthaginians as nearly as possible to a land fight. By the use of grappling irons peculiarly contrived the Roman vessels were firmly attached to those of the enemy, and a struggle ensued, in which superior force and determination alone could influence the result. Thus the first great naval battle of Rome, fought off the Lipari Islands, B.C. 260, by the fleet of Duilius against a Carthaginian fleet of superior size under a leader named Hannibal, resulted in a complete victory, which was celebrated by a triumph at Rome.

The *galley*, the war vessel of the ancients, the construction of which has been discussed in our article GALLEY, was a narrow vessel about 100 feet in length. It was admirably fitted to move rapidly in smooth water, and the numerous rowers gave great impetus to the attack of the beak, which was its principal means of aggression. The bow curved inwards, forming a circular beak, which was faced with iron: or else it receded suddenly, having a single sharp point like a ploughshare, projecting at the surface of the water, and intended to open the side of an antagonist. Frequently the beak was formed to represent a lion, tiger, or other ravenous beast calculated to inspire terror. It was always surmounted by the national emblem: thus an owl stood on the prow of an Athenian galley; a cock on a Phœnician or Carthaginian; and the eagle on a Roman. Here or at the stern were also placed the ensigns and standards, and trumpeters standing beside them sounding their shrill blasts to inspire courage at the moment of onset. From the bow to the stern there extended a flooring or deck, which served as a battle-field for the mailed and heavy-armed soldiers. The stern was covered with a circular shed or pavilion, richly carved and decorated with streamers and trophies. Under this was placed the *tutela*, representing some patron deity, to which sacrifices and prayers were offered, and which was held so sacred as to furnish a sanctuary to whoever took refuge there. From this elevated station, too, the commander surveyed the fight and directed the efforts of his followers. There were two distinct classes of officers and men in each galley. The commander of the soldiers was supreme, and under him the pilot, who took his station abaft, at the side of the steersman, directed all necessary evolutions and manœuvres. The pilot was assisted in the command of the sailors by his mate, and by the boatswain or encourager of the rowers; whilst a musician marked the measure of the stroke, and by the harmony of his voice and instrument inspirited the rowers when weary with toil. The rowers were frequently, as in modern times, malefactors chained to the oar.

Javelins and arrows were discharged in showers from the deck, or from turrets at the bow and stern. As a protection from these a curtain of hides was used, from behind which the soldiers discharged their missiles in return, and thrust with long spears used only at sea. In the centre were engines from which rocks were projected of size sufficient to sink a ship: and masses of iron called *dolphins* were projected from the mast-heads to break the bottom of the enemy's vessel. But the chief means of offence was the attack of the beak, and to make it with advantage it was generally desired to gain the wind. Combustibles were also cast from ship to ship, and peculiar devices due to the ingenuity of the particular commanders adopted on special occasions. The line of battle was usually triangular, the admiral's ship being at the angle in advance, and the line of storeships forming the base. Before encountering it was usual for the admiral to pass in a small boat throughout his fleet, haranguing his followers, and urging them to do their duty. Thus inspirited a shout of

anticipated triumph would pass from ship to ship, and when the gilded shield was at length displayed as a signal for battle, the shrill trumpets sent forth their blasts, and the combatants rushed to the encounter, rending the air with shouts and war songs. The battle won, the victors returned to port, towing their prizes, their ships being decorated with fragments of the wrecks, themselves crowned with laurel, and singing pæans to Apollo. The richest of the spoils was reserved as an oblation to the gods, and broken or sometimes entire galleys were placed in the precincts of the temples. Little change was made by the Romans in their mode of warfare down to the time of the fall of the empire. The emperors of Constantinople had still a fleet of galleys propelled by rowers.

On the fall of Tyre Alexandria, founded by Alexander the Great, revived the commerce of Egypt; and after Egypt fell under the Roman yoke it became the chief commercial city of the empire. It continued to flourish as a commercial place until it was taken by the Saracens about 640. Several of the Greek cities also continued to carry on a considerable naval traffic, and Antioch in Syria, through its port Seleucia, shared in the riches of the trade of the Mediterranean. The Gauls also began to develop a degree of maritime strength. The vessels of the ancients being of comparatively light draught were frequently grounded on arriving at port. Artificial harbours were, however, constructed with great labour. They were frequently constructed with semicircular piers, with the ends overlapping to exclude the sea. At the entrance was placed a light-tower called the Pharos, from the island at the mouth of the Nile, where the first was supposed to have been erected. In the inner port were docks for building and repairing vessels.

On the fall of the Roman Empire naval enterprise declined, but only for a brief period. The honour of reviving it is disputed by the French and the Italians. To the latter chiefly belongs the honour of leading the way in the development of modern European commerce, but for the growth of naval armaments we must look also to the north of Europe. Charlemagne had a considerable fleet both on the Mediterranean and the ocean; but already in his time, and even in that of his predecessors, the settled states of Europe had begun to become subject to the piratical excursions of Northmen and Danes, which were afterwards directed so persistently against England, and continued for several centuries to disturb its government.

In the meantime the Italian republics of Venice and Genoa began to restore the commerce of the Mediterranean, and to open up communications with India by the Red Sea and the Persian Gulf. The Pisans and Florentines followed, and in the time of the Crusades the chief naval armaments of the Christians were supplied by the Italian cities. The successors of Charlemagne did not follow his example in maintaining a regular fleet, yet Saint Louis was able to transport his own army to Africa, and to defend his coast against the English; but Philip le Bel had recourse to the Genoese against the English. The great naval battles of these times were fought among the Italian republics, or by them against the Turks, with whom they alternately traded and made war.

After the epoch of the Crusades we have a period extending to the present time, which in one aspect of its development might be called the epoch of commerce, and especially of mercantile navigation. The honour of leading the way in this new epoch belongs to the Portuguese. They were followed by the Spanish, the English, the Dutch, the French, and ultimately by all the other nations of Europe, according to their means and opportunities. A great development of European commerce, a career of geographical discovery, which for the first time demonstrated the form, and made exactly known not only the principal features, but the more minute details, of configuration of the globe, and the inauguration, on a scale more extensive than any former epoch of history has exhibited, of a system of colonization by the more civilized nations of the less peopled and less civilized regions of the world, were the main results of this movement. For the details of the first of these processes the reader must be referred to the histories of the various countries concerned. In our articles GEOGRAPHY and COLONY an outline of geographical discovery and colonization has been given. We shall here give a brief outline of the discoveries in the art of navigation which have resulted from the efforts of navigators to extend the boundaries of their excursions, and which have rendered these efforts so successful.

One of the earliest of these discoveries, and the most important to the progress of navigation of them all, was that of the polarity of the magnet, which led to the construction of the mariner's compass (see COMPASS, MARINER'S) emancipating the sailor from the trammels to which he was subjected by the want of a constant and uniform guide in the direction of his course. The polarity of the magnet was not known to the ancients. Pliny, in his description of the properties of the magnet, makes no mention of it. It was, indeed, known from time immemorial to the Chinese, but, like most of the discoveries of that extraordinary people, it remained buried among themselves, and for the purposes of civilization practically inoperative. The merit of discovering or introducing it in Europe has been attributed to Flavio Gioia, born about 1290, but it was probably known before his time. The enterprise of the Portuguese navigators, fostered by a line of enlightened kings, and especially by the personal predilections of Prince Henry, surnamed the *Navigator* (1394–1460. See HENRY the Navigator), who surrounded himself with men of skill in the sciences relating to navigation, and gave a stimulus to its improvement which extended far beyond his own day, led to an important series of improvements, which the emulation of other nations tended to perfect. The use of the astrolabe to discover the latitude from the elevation of the pole-star originated with Henry or his assistants. He also caused charts to be made according to the knowledge of his day, which was of itself a step to the improvement of that knowledge. He also caused tables to be computed of the sun's declination. From this time the progress of navigation was rapid. The variation of the compass was observed by Columbus and Cabot. The cause to which it is still generally assigned was explained by Martin Cortes in 1545. Pedro Nuñez in 1537 propounded the principle of great circle sailing, or that the shortest distance from place to place along the surface of the globe is to be found by following a great circle of the sphere, not by sailing on a parallel of latitude. The errors of the plain chart were exposed by Cortes, and a plan was first adopted by Gerard Mercator, but scientifically demonstrated and developed by Edward Wright, in which, by expanding the degrees of latitude in approaching the poles, the proportion between them and the degrees of longitude is maintained, and the rhumbs extended into straight lines. This is the principle on which the charts called Mercator's are now projected. (See MAP.) The invention of logarithms by Napier of Merchiston (1550–1617), and of Gunter's scale (1624), put within reach of the mariner the means of making arithmetical calculations and working out his o-

metrical problems with a promptitude and accuracy hitherto unattainable. The circumference of the earth was ascertained on a method recommended by Wright, by measuring the distance between London and York, and taking the altitude of the sun at the summer solstice at both places. By this means the length of a degree of a great circle of the earth was ascertained. The log, an early contrivance for measuring the length of a vessel's course (mentioned in a treatise by William Bourne in 1577), was corrected accordingly. Hadley's quadrant, an instrument by which the altitude of heavenly bodies could be measured without disturbance from the motion of the vessel, and which led to the contrivance of the more perfect instrument the sextant, was introduced about 1730. The successive improvements of the chronometer facilitated the taking of longitude by observing the difference of time at different places, the chronometer being set according to the time of the first meridian and the ship's time taken from observation of the sun. Tables of the moon's motions for ascertaining the longitude, invented by Meyer and perfected by Maskelyne, are now published periodically by the British government. Among the recent improvements in the appliances for facilitating navigation a high place is due to the great improvements which have been effected in the construction of charts, through accurate surveys and soundings, by which the exact latitude and longitude of harbours, and the peculiarities of their channels, are ascertained.

Simultaneously with the progress of the art of navigation the growth and development of national fleets, stimulated by the rivalry of the maritime nations, has made way. From the early days of colonization, when the ships of the rival powers used to fight with each other without a declaration of hostilities when the pursuit of a common object brought them together, to those of the well-ordered and disciplined fleets of modern times, there has been a continuous emulation among European powers for the sovereignty of the seas. The principal naval contests have taken place between Spain and England, England and Holland, and England and France. The result has uniformly been to establish the superiority of England, whose insular position, together with the adventurous disposition and constructive genius of the people, has at length left her the almost undisputed supremacy of the sea. The policy of England has, however, been less successful than her naval force, and the interpretations of maritime law for which she has contended successfully against the united powers of Europe have been gradually relinquished in times of peace. The Spanish navy reached its highest power in the time of Charles V. and Philip II. Francis I. attempted the revival of the French marine, and it was vigorously undertaken by Richelieu. The administration of Colbert revived both the mercantile and national navy, and the latter attained its chief strength and highest glory in the reign of Louis XIV., when it opposed, and sometimes not unsuccessfully, the united navies of England and Holland. The navy of Holland became powerful almost from the time of the national independence, and contended with success alternately against the fleets of England and France. Some of the most hotly contested naval battles on record have been fought between the English and Dutch fleets. At a later period the United States of America developed a formidable naval power, but the priority still remained with England.

Cannon are said to have been first used in naval warfare by the Venetians against the Genoese in 1370, a considerable time after their invention. From this time until a comparatively recent period there was nothing to distinguish the development of naval armaments from the general progress of navigation. The battle of Lepanto, fought between the Christian powers and the Turks, on 7th October, 1571, may be considered as representative of the first stage of the transition from the earlier mode of warfare. The Christian fleet was collected in the port of Messina in September, 1571. It was contributed by the powers who had joined in the Holy League. The Spanish fleet consisted of seventy-seven Spanish, six Maltese, and three Savoyard galleys under Don John of Austria, who commanded the joint fleet; there were twelve Papal galleys, under Marc Antonio Colonna; and 106 Venetian galleys, and six galeazzi, under Sebastian Veniero. The Turkish fleet, consisting of 300 vessels, under the Capudan-pasha, Musinsade Ali, lay in the Gulf of Lepanto. Although the Turks were more numerous the Christians were better armed and equipped. Their soldiers wore coats of mail and helmets, and were provided with fire-arms. The Turks defended themselves with leathern shields, and had bows and arrows in place of guns. The prows of the Christian galleys were less open and better defended than those of the Turks. The admirals, according to ancient custom, led the van. Both parties moved to the assault, but the wind changing at the moment favoured the Christians. The admirals' galleys closed after a brief cannonade, and grappled each other. The Spaniards boarded three times, and were thrice driven back. A reinforcement of 200 men enabled them to return again to the assault with decisive effect, and an indiscriminate slaughter of the Turks took place. The head of Ali was exhibited on a pole to his followers. The battle after this only waxed fiercer, and the Turks fought with the courage of despair. So intense did the struggle become that the galley slaves in both fleets joined in the contest, but while the galley slaves of the Christians, who consisted of criminals, fought on their own side in hope of earning a pardon, those of the Turks, who were Christian slaves, rose against their masters. Fifteen thousand Christians are said to have been relieved from servitude by the victory. The Turks lost besides 224 ships and 30,000 men.

The improvements determined by the use of artillery were chiefly an increase in the size and offensive strength of the ships, and a relative diminution in the number of men. Oars were abandoned for sails. The ships were fought and manœuvred by the sailors, and the marines or organized body of soldiers became a mere auxiliary force, available as sharp-shooters and for land engagements. Two leading qualities now stood forth as the most important object to be attained in the construction and equipment of vessels for war—strength of offensive armament, and speed and facility of manœuvring. These qualities did not now first acquire importance, but they gained in relative importance at the expense of a previously preponderating element of equipment, namely, the number of fighting men available for assault at close quarters. Two classes of vessels, according to the preponderance of one or other of these qualities, thus came to constitute the chief strength of modern fleets.

The ship of the line, or first-class war vessel, carried the strength of offensive equipment to the utmost limit practicable without sacrificing sea-going qualities. The frigate, only excelled in strength by a line-of-battle ship, was built and rigged with every artistic appliance to secure speed. Even line-of-battle ships were sometimes made too heavy for effective service, and facility of movement could not be altogether neglected with impunity; but the great point in a first-class vessel was the weight of broadside, and a hundred or more guns on three decks were commonly carried. In a pitched battle it was the

line-of-battle ships that bore the brunt of the fight and decided the day. The frigates scoured the seas on special missions, escaped from the enemy's line-of-battle ships by speed, destroyed his privateers, and protected the commerce of their own state. During all the great European wars these were the leading types of vessels employed. The 'wooden walls of England' was then the familiar designation of the most powerful navy in the world. The tactics of naval warfare during this period, allowance being made for the different means of offence, did not differ materially from the ancient methods. To gain the wind of an adversary, to break his line, and to engage him at close quarters with superior force, were still the main objects to be pursued. But a change took place when steam was introduced as a means of propulsion and iron as a material for the construction of vessels. Vessels clad in iron armour now came to supersede the oak-built ship of the former epoch. More recently improvements in the size, range, and destructive power of projectiles have effected a new revolution, or succession of revolutions, in the science of naval armaments, and the broadside has given way to a small number of powerful guns. The struggle between these new developments of offensive and defensive force still goes on. Iron-clad line-of-battle ships, turret-ships, and gun-boats have superseded the wooden walls, but their own position has yet, perhaps, to be maintained against newer rivals. Of the present state of development of the new naval force we have already given an account in the article IRON-CLAD VESSELS.

The navies of Europe and America have not been merely the instruments of national ambition and aggrandizement. They have often efficiently served the cause of science, and they have performed a service still more indispensable and valuable in acting as the police of the high seas. In former epochs, as the student of history is aware, the bounds which divided naval commerce from piracy were thin; now the feeblest merchant ship can trade safely to every part of the world, or if there is any point unprotected the complaint has only to be made to bring the remedy. For two things the world is indebted to private or public naval enterprise. It has turned the tide of emigration, which formerly flowed too often from the barbarous to the civilized, and made civilization everywhere invade the realms of barbarism; and it has dissociated commerce from war, and made the peaceable pursuit of industry as an object of ambition preferable to the career of violence.

The principal war navies in the world at the present day are those of Great Britain, France, Germany, Italy, and the United States. On the 1st of September, 1883, the British navy consisted in all of 240 vessels in commission, of which 136 were sea-going steamers and the remainder reserve steamers and sea-going vessels. The most important division of the navy is the iron-clad fleet of war, which at the end of 1882 consisted of 55 efficient vessels, exclusive of those not then completed and 3 others built solely for colonial defence. The 55 efficient vessels were armed with 509 guns, had an aggregate tonnage of 322,450 tons, and indicated 306,510 horse-power. On the 1st of January, 1882, the French war navy consisted of 57 armour-clad vessels (including coast-guard cruisers and gunboats), 326 steamers, not armour-clad, and 113 sailing vessels; in all 496 vessels. The German war navy in 1883 consisted of 89 vessels ready for service, including 12 vessels of war, 37 cruisers, 28 coast-guard ships, 10 transports and despatch boats, and 12 training-vessels. They were armed in all with 525 guns, had an aggregate tonnage of 173,526 tons, and were of 153,650 horse-power. The Italian navy on the 1st of January, 1883, was composed of 86 vessels, of which 57 were vessels of war (16 armour-clad) and 29 transport ships. The number of guns was 661, the tonnage 260,800, the horse-power 91,986. The United States war navy in 1882 was composed of 139 vessels, including 24 iron-clads carrying 68 guns. The total number of guns in the entire navy was 1033.

The principal merchant navies of the world are those of the United Kingdom, France, Germany, Norway, Italy, and the United States. At the end of 1882 that of the United Kingdom, including the Isle of Man and the Channel Islands, comprised 10,920 sailing vessels of 3,344,159 tons burden, and 4239 steamers of 3,301,317 tons above 50 tons burden, making a total of 15,159 vessels of 6,645,476 tons, while the grand total of sailing vessels and steamers, including those below 50 tons, was 24,706 of 6,956,865 tons. At the beginning of 1881 the French merchant navy numbered 15,126 vessels of 914,373 tons, of which 735 of 311,779 were steamers chiefly belonging to the Messageries Maritimes. On the 1st of January, 1882, the German merchant navy consisted of 4509 vessels of 1,194,407 tons, but in this number are included only vessels exceeding a capacity of 50 cubic metres, which is equivalent in steamers to a burden of 15 metric tons (1000 kilos), and in sailing vessels to one of 22 metric tons. The number of steamers was 458 of 251,648 tons. The Norwegian merchant fleet consisted at the end of 1881 of 7977 vessels of 1,520,404 tons, 359 of 65,627 tons being steamers. At the end of 1882 the Italian fleet (including only vessels making long voyages) consisted of 7528 sailing ships of 885,285 tons, and 192 steamers of 104,719 tons; total, 7720 vessels of 990,004 tons. The shipping belonging to the United States on the 30th June, 1882, numbered 24,368 vessels of 4,165,933 tons, of which 2331 of 1,331,096 were large sea-going vessels, including whalers; the number of steamers was 5191 of 1,355,826 tons.

NAVIGATION, LAWS REGARDING. From an early period laws intended to restrict the importation of commodities or other branches of the shipping trade to vessels owned and manned by English subjects were enacted in England, as similar laws were in other countries. The commodities subject to this restriction varied from time to time according as it was the policy of the country to encourage or discourage particular branches of trade. The navigation acts passed by the Long Parliament in 1650 and 1651 formed the foundation of the subsequent restrictive policy in this kingdom. The latter act was specially levelled against the Dutch carrying-trade. It enacted that no goods, the production or manufacture of Asia, Africa, or America, should be imported into England, Ireland, or any of the plantations, except in ships belonging to English subjects, and of which the master and the majority of the crew were English; and that no goods the growth, production, or manufacture of any country in Europe, should be imported into England except in English ships, or in such ships as were the real property of the people of the country or place in which the goods were produced, or from which they could only be or usually were exported. The same principle was adopted in the Act 12 of Charles II. cap. xviii., and continued till recently to be the principle of English law. It was defended mainly on the ground of the importance of encouraging the growth of a national navy, and the danger to which in time of war Britain might be exposed by having her trade dependent on foreign carriers. Adam Smith, while aware of its commercial disadvantages, defends it on this ground. Various modifications of the law took place in subsequent acts, but it was after the repeal of the corn-laws that the principle of the act was attacked with success

By the 12th and 13th Vict. cap. xxix., passed 26th June, 1849, the restrictions on foreign shipping were repealed except in regard to the coasting trade; the restrictions as to the manning of British ships were repealed by the Merchant Shipping Act, 1853; and by the 17th Vict. cap. v. (23d March, 1854) the coasting trade was thrown open to foreign vessels, subject to the same rules as British vessels, and with power to the queen in council to impose retaliatory restrictions upon the vessels of countries which impose restrictions on British shipping. The laws relating to navigation accordingly now apply equally to British ships and to foreign vessels conducting trade between British ports. For the various headings under which these acts are treated of, see MERCHANT SHIPPING ACT.

NAVIGATOR'S (or SAMOAN) ISLANDS, a group of nine islands in the Southern Pacific Ocean, northeast of the Friendly Islands, between lat. 13° 30′ and 14° 30′ S., and lon. 168° and 173° W. Like most other islands of those seas, they are surrounded with coral-reefs, and appear to be of volcanic origin. The total area of the group is calculated at 1075 sq. miles, with a pop. of 36,800. The islands abound in cocoa-nuts, bread-fruit, and bananas. The only staple trade is in cocoa-nut oil.

NAVY. See NAVIES AND NAVIGATION.

NAXOS, or NAXIA, an island of Greece, in the Grecian Archipelago, the largest of the Cyclades, south from Mycone; lat. 37° 12′ 30″ N.; lon. 25° 33′ E.; area, 170 square miles. It is hilly, but extremely productive, yielding fruit, wine, oil, cotton, silk, wheat, and barley, while the higher grounds afford pasturage for cattle; cheese, honey, and wax are also exported. There are quarries of granite, marble, and serpentine, and on the west coast is a mine of emery. Abundance of marcasite or sulphuret of iron is also found; when polished it has for a time almost the lustre of real brilliants, and was formerly much used in the manufacture of ornaments in England. In ancient times Naxos was celebrated for its wine, and played a prominent part in the legends about Dionysus. It was inhabited by Ionians who had emigrated from Athens. It was conquered by the Persians B.C. 490, but recovered its independence ten years after by the battle of Salamis. The chief town is Naxia, near the north-western part of the island, on a small bay with a harbour and roadstead, the latter rather insecure. It occupies the site of the ancient Naxos, and is defended by a castle. Pop. 4000; pop. of the island, 19,912.

NAZARENES, a designation given to the early Christians from the town of Nazareth, where Christ dwelt. It was foretold (Matt. ii. 23) that Jesus himself should be called a Nazarene, and it is asserted by the evangelist Matthew that it was in fulfilment of this prophecy that his parents were directed to take up their residence in Nazareth. The name is still a common Arabic designation for a Christian.

NAZARETH, a small town, anciently of Galilee, in Palestine, in the pashalic of Acre, and 65 miles north of Jerusalem, celebrated as the residence of our Saviour during his youth. It is beautifully situated in a little dell or basin surrounded on all sides by hills. The houses are of stone, well built, with flat roofs. The principal edifices are the conventual buildings of the Franciscan monks, including the Latin Church of the Annunciation, with their different inclosures surrounded by strong walls; the Casa Nuova, or house built by the convent for the accommodation of travellers; and the Mohammedan mosque. There is also a khan of considerable size at the entrance to the town. Pop. about 3000.

NAZARITES, among the Jews, persons who dethemselves to the peculiar service of Jehovah for a certain time or for life. Their vow (which might be taken by persons of either sex) bound them during the period it was in force not to cut their hair or drink wine or any strong drink, or touch a dead body. It was foretold of Samson that he should be a Nazarite unto God from the womb. So Hannah vowed her first-born son (Samuel) to Jehovah all the days of his life, with the promise that no razor should come near his head. The law of the Nazarites (from the Hebrew *nazar*, to separate) is contained in Numbers vi. 1–21.

NEAGH, LOUGH, a lake, Ireland, by far the largest in the British Isles, being 17 miles long by 11 miles broad, and covering an area of 153 square miles. It washes the county of Antrim on the north and east, Armagh on the south, and Tyrone and Londonderry on the west. The shores are low and moorland, often swampy or flooded, and scantily supplied with wood; islands are almost entirely wanting, and the whole expanse is destitute of interest. Its chief feeders are the Upper Bann, Blackwater, Maine, Six Mile, and Ballinderry, and its outlet is at its north extremity through Lough Beg into the Lower Bann. It is only 46 feet above the level of the sea, and it has been estimated that its outlet might easily be deepened, and 25,000 acres of land thus gained for culture. The traffic upon it is carried on chiefly by steamers. Its waters are well known for their petrifying properties.

NEAL, DANIEL, an English Dissenting divine and historian of the Puritans, was born in London, December 14, 1678. After studying at the Universities of Utrecht and Leyden, he came to London, and in 1703 he began to officiate as a preacher, and in 1706 succeeded Dr. Singleton as minister of a congregation in Aldersgate Street. Although assiduous as a minister, he found leisure for literary labours, and in 1720 published his History of New England (two vols. 8vo), and soon after a Narrative of the Method of Inoculating for the Small-pox in New England. In 1732 he sent into the world the first volume of his History of the Puritans (8vo), the second, third, and fourth appearing in 1733, 1736, and 1738. This work called forth a Vindication of the Doctrine, Discipline, and Worship of the Church of England (8vo) from Dr. Maddox, bishop of St. Asaph, to which Neal published a reply, entitled A Review of the Principal Facts Objected to, &c. His remaining volumes were reviewed by Dr. Grey, to which an answer appeared in a new edition of Neal (1797, five vols. 8vo) by Dr. Toulmin. He died at Bath in April, 1743.

NEANDER, JOHANN AUGUST WILHELM, a distinguished Protestant theologian, born of Jewish parents at Göttingen in 1789, spent the greater part of his youth in Hamburg, where he attended the gymnasium and Johanneum. After becoming a convert to Christianity, he studied for some years, beginning with 1806, at Halle and Göttingen. In 1811 he qualified himself as a teacher at the University of Heidelberg, and in 1812 was appointed to one of its chairs as extraordinary professor of theology. The same year, however, he accepted an invitation to the University of Berlin, where he spent the remainder of his life in uninterrupted labours for the good of the church and general learning, and more especially for the benefit of the students attending his lectures. He died in 1850. His first work, Ueber den Kaiser Julianus und sein Zeitalter (Leipzig, 1812), proved him to be a master in this period of church history. This work was followed by Der heilige Bernhard und sein Zeitalter; Genetische Entwickelung der vornehmsten gnostischen Systeme; Der heil. Chrysostomus und die Kirche, besonders des Orients, in dessen Zeitalter, and Antignosticus: Geist des Ter-

tullianus und Einleitung in dessen Schriften. In his Denkwürdigkeiten aus der Geschichte des Christenthums und des christlichen Lebens, Neander sought to make the laity acquainted with whatever is important in church history. All these writings, however, were only preliminary to his great work on the history of the Christian church, Allgemeine Geschichte der christlichen Religion und Kirche (vols. i.–vi. eleven parts, Hamburg, 1825–52; vols. i. and ii., second edition, 1842–43). He also wrote Geschichte der Pflanzung und Leitung der Kirche durch die Apostel; and in opposition to Strauss, Das Leben Jesu Christi in seinem geschichtlichen Zusammenhange (Hamburg, fifth edition, 1853). His lectures at the university, a great number of which have been published since his death, embraced all branches of historical theology. Though his health was very indifferent, he devoted all the time not employed in professional and literary labours to intercourse with his students, by whom he was greatly loved. A collected edition of his works began to appear in Germany, at Gotha, in 1862. Many of them have been translated into English, and published in Bohn's Standard Library.

NEAP-TIDES are those which happen when the moon is nearly at the second and fourth quarters. The *neap*-tides are low tides in respect to their opposites, the *spring*-tides.

NEARCHUS, one of the captains of Alexander the Great, who was employed by that conqueror in conducting his fleet from India by the ocean to the Persian Gulf (326–325 B.C.). This service was so much esteemed that he was crowned with a garland by Alexander at Susa, and received in marriage a daughter of Mentor and Barsine, to whom Alexander himself had previously been married. After the death of Alexander, and the consequent division of his empire, Nearchus held the government of Lycia and Pamphylia under Antigonus. Nearchus is the author of an account of his voyage from India to the Persian Gulf, bearing the title Paraplus, the substance of which is given by Arrian in his Indica, for the latter part of which it formed the whole of the material. The work is also quoted by Strabo.

NEATH, CASTELL NEDD, a town in South Wales, in the county of Glamorgan, 7 miles E.N.E. of Swansea. It carries on a considerable trade, importing copper, iron, and zinc ores, corn, flour, timber, &c.; and exporting coal, copper, iron, castings, spelter, firebricks, &c. The port is a creek to that of Swansea; a new dock is being constructed. It unites with the Swansea district of boroughs in sending a member to Parliament. Near the town are the remains of Neath Castle and Abbey, both erected in the twelfth century. Pop. (1881), 10,447.

NEBRASKA, one of the United States of North America, bounded on the north by the territory of Dakotah, west by Wyoming and Colorado, south by the state of Kansas, and east by the Missouri river, which separates it from the states of Iowa and Missouri. Area, 76,855 square miles. The greater part of the territory is still in a state of nature, though it is now being rapidly occupied by colonists. On the west are the outliers of the Rocky Mountains, which rise up majestically, forming the watershed between the Atlantic and the Pacific Oceans; in the centre, an apparently irreclaimable wilderness, covered with abrupt masses of picturesque rocks, belonging to the great American desert, called Mauvaises-Terres; and in the east extensive tracts of prairie, which may yet be turned to good account. The principal rivers are the Missouri, which forms the boundary on the east; its great affluent, the Nebraska or Platte, which, formed by two main forks, a northern and a southern, both from the Rocky Mountains, traverses the territory in an eastern direction; and the Republican Fork of Kansas River, traversing the southern part of the state. The climate is, on the whole, fine; the summers are long and warm, the mean temperature being 70° to 74°, and the strong but healthful breezes which sweep across the prairies temper the extreme heat; the winters are generally not rigorous, though the temperature is occasionally low, the mean temperature ranging from 22° to 30°. The soil, except in the north-west and south-west, is a deep rich loam underlaid by a porous clayey subsoil, and is thus admirably adapted to withstand drought. About one-fourth of the state is under cultivation, the principal crops being maize, wheat, oats, barley, potatoes, and hay. The wild animals still abounding in the unsettled regions include the buffalo, grizzly, black, and brown bears, the Rocky Mountain sheep, antelopes, deer, elk, panthers, raccoon, opossum, otter, serpents, both venomous and harmless, wild turkeys, grouse, &c. Manufactures may still be said to be in their infancy, but are rapidly developing; they include flour and meal, carpentry and building, boots and shoes, distilled and malt liquors, iron-founding, machinery, pork-packing, &c. The strata of coal occurring in the state is remarkably thin and furnishes only a local supply. There are numerous salt basins in the central and western districts, and an extremely pure salt is manufactured by solar evaporation. The commerce is exclusively internal, and passes over the railways of the state, which had at the end of 1882 a length of 2494 miles open for traffic. At the head of the educational establishments stand the State University at Lincoln, the Protestant Episcopal College in Nebraska City, the Congregational College at Crete, and the state normal school at Peru. In all the principal towns there are graded and high schools supported by general and local taxation, and a generous share of the public lands has been set apart for educational purposes. The governor of the state is elected for four years, and the legislature meets biennally. Nebraska has three electoral votes, and sends one member to the Lower House of Congress. It came into the possession of the United States as part of Louisiana in 1808, was recognized as a separate territory in 1854, and was admitted into the Union as a state in 1867. Since then, and more particularly since the opening of the Union Pacific Railway, the increase of Nebraska in wealth and population has been remarkably rapid. The settlers consist generally of immigrants from the more northern states, with an intermixture of Germans, English, and Irish. The capital is Lincoln. Pop. in 1870, 122,993; in 1880, 452,402.

NEBRASKA CITY, a town in the United States, the capital of Otoe county, Nebraska, on the right bank of the Missouri, about 44 miles below Omaha, with which and with Lincoln it is connected by rail. The site of the city is undulating, and as yet the houses are mostly of wood. It contains the Nebraska College (Episcopal), a court-house, public halls, numerous churches and schools; there are a foundry, machine-shop, tannery, breweries, brickworks, carriage-works, &c. The Missouri is navigable for large steamers during five months of the year to a point about 50 miles above the town. The inhabitants are mainly employed in trade with the mountains and plains, and in transporting goods to the western territories. Pop. 4183.

NEBUCHADNEZZAR (in Jeremiah and Ezekiel, *Nebuchadrezzar;* Greek, *Nabuchodonosor*), a king of Babylon, celebrated as the conqueror of Judah. He reigned from 604 to 561 B.C. according to the opinion of modern chronologists, or from 605 to 563 B.C. according to that of older chronologists.

He was the son of Nabopolassar, by whom the Kingdom of Babylon was definitely made independent of the Assyrian monarchy. In the fourth year of Jehoiakim, king of Judah (605–4 B.C.) he defeated Pharaoh-Necho, King of Egypt, at Carchemish (Circesium), on the Euphrates, after which he advanced against Jerusalem, and took it, making the Kingdom of Judah tributary to Babylon, carrying off with him the sacred vessels of the temple, besides a number of Hebrew youths distinguished for their handsome appearance and noble birth; among them Daniel and his three companions, Hananiah, Mishael, and Azariah. During this expedition it appears that his father died, and after his return to Babylon Nebuchadnezzar ascended the throne without opposition. In 598 or 597 B.C. Jerusalem was again taken by Nebuchadnezzar. He had been engaged in the siege of Tyre when he heard of certain machinations set on foot by a party in Jerusalem, who still looked to Egypt for aid against the Babylonian conqueror. On this occasion the city was saved from being stormed by the surrender of the king Jehoiachin, with his mother Nehushta, but Nebuchadnezzar carried into captivity large numbers of the inhabitants. Among the captives on this occasion were Ezekiel and Shimei, the grandfather of Mordecai. Mattaniah, the uncle of Jehoiachin, was then made king of Judah, under the name of Zedekiah, on the condition of taking an oath of fealty to his conqueror. This oath Zedekiah subsequently broke by entering into a treasonable correspondence with Psammetichus (Psamatik) II., who had succeeded Pharaoh-Necho as king of Egypt. Nebuchadnezzar, whose forces were still engaged in the siege of Tyre, detached a portion to lay siege to Jerusalem, which was taken by storm at the end of two years and a half (586 B.C.). The city was then totally destroyed by fire. Zedekiah, who had fled, was taken, and had his eyes put out. In the following year (585 B.C.) Tyre also fell, which was the last place in Syria that held out against Nebuchadnezzar. During the peaceful years of his reign he rebuilt in a magnificent manner Babylon and many of the other cities of the empire, and constructed vast temples, aqueducts, and palaces, whose ruins still testify to his grandeur. The scriptural account of his eating grass like an ox for seven years (Daniel iv. 33) is by some understood to mean that he was afflicted with the disease called *boanthropy* (which see); by others, to be susceptible of an allegorical interpretation.

END OF VOL. IX.

GLASGOW: W. G. BLACKIE AND CO., PRINTERS, VILLAFIELD.

SOME WORKS PUBLISHED BY

BLACKIE & SON,

LONDON, GLASGOW, EDINBURGH, AND DUBLIN.

In 14 parts, super-royal 8vo, at 2*s.* each; or 7 divisions at 4*s.* each.

The World as it Is:

A Popular Account of the Countries and Peoples of the Earth. By GEO. G. CHISHOLM, M.A., Editor and Translator of "Switzerland: Its Scenery and Its People." Profusely illustrated by over 300 Engravings, and a series of Maps and Plates printed in colours.

This work naturally divides itself into three sections. The *first* contains all that belongs to the description of the world as a whole, and not specially to any of its divisions. The *second* deals with the descriptive and political geography of the world. These two sections are illustrated by numerous diagrams, views of interesting localities, and groups of the inhabitants, interspersed through the text so plentifully that one is to be met with at almost every other opening of the book. The *third* section will be composed of a list of about 10,000 geographical names, whose pronunciation is shown by being re-written according to an easily understood plan. A copious Index will be added, whereby all the information contained in the book will be made readily accessible.

To be completed in 14 parts, super-royal 8vo size, price 2*s.* each; or 4 vols., cloth elegant, burnished edges, 9*s.* 6*d.* each.

William Ewart Gladstone

AND HIS CONTEMPORARIES: Fifty Years of Social and Political Progress. By THOMAS ARCHER, F.R.H.S., Author of "Pictures and Royal Portraits," &c. Illustrated by a series of 32 authentic and beautifully executed Portraits.

"*This work is not so much a biography of Mr. Gladstone as a political History of England during his lifetime. It is a book which has evidently been compiled with no ordinary pains and care, and with a praiseworthy desire to be impartial.*"—Daily News.

"*It is probably true that the biographical form of history is the best in dealing with times within the memory of men yet living. The life of a man, prominent in affairs during a particular period, may be taken as a central point round which matters of more general history group themselves.*"—Standard.

To be completed in 4 vols., super-royal 8vo, cloth elegant, 8*s.* 6*d.* each; or 14 parts, 2*s.* each.

The Cabinet of Irish Literature.

A Selection from the Works of the chief Poets, Orators, and Prose Writers of Ireland. Edited, with biographical sketches and literary notices, by CHARLES A. READ, F.R.H.S., author of "Tales and Stories of Irish Life," "Stories from the Ancient Classics," &c. Illustrated by a series of 32 admirable Portraits in mesochrome, specially prepared for this work.

The Publishers aim in this Work to supply a standard work where the genius, the fire, the pathos, the humour, and the eloquence of Irish Literature are adequately represented. The specimens selected, which will be arranged chronologically from the earliest to the present time, will both present a historical view of Irish Literature, and enable the reader to judge of the individual style and particular merit of each author, while to those not critically [illegible]ety presented in this convenient collective form will afford both instruction and amusement.

To be completed in 5 divisions, royal 4to, 8*s.* each; or 20 parts, 2*s.* each.

Suggestions in Design;

A comprehensive series of Original Sketches in various Styles of Ornament, arranged for application in the Decorative and Constructive Arts, comprising 102 plates, containing more than 1100 distinct and separate "Suggestions," by JOHN LEIGHTON, F.S.A. To which is added descriptive and historical letterpress, with above 200 explanatory engravings, by JAMES KELLAWAY COLLING, F.R.I.B.A.

The engravings have not been taken from other examples, or collected from already published works apart from those by the author, but are entirely original, designed in the spirit, and with the proper art feeling of the various styles to which they severally belong, and are the accumulated result of long and arduous studies, extending over many years of investigation and thought.

This work will be found to be eminently suited to the wants of nearly every one who has occasion for decoration in whatever form;—to the worker in stone, wood, metal, ivory, glass, and leather,—to the house-painter, decorator, manufacturer of wall-papers, carpets, curtains, and floor-cloths,—to the potter, weaver, calico-printer, engraver and lithographer,—as well as to others too numerous to mention.

In one volume, imperial 4to, half-morocco, 70*s.*; or 20 parts at 2*s.* 6*d.* each.

Villa and Cottage Architecture.

SELECT EXAMPLES OF COUNTRY AND SUBURBAN RESIDENCES recently erected; with a full Descriptive Notice of each Building.

Thirty Villas and Cottages, besides Gateways and other accessories, the works of NINETEEN ARCHITECTS, illustrated by Plans, Elevations, and Sections, together with Perspective Views and Details, all finely engraved, and forming a Series of Eighty Plates. The Buildings illustrated are situated in widely-separated parts of the country, and are varied in style, arrangement, and materials. A description of the site, the internal arrangements, materials, and manner of construction, accompanies each set of plans; with a statement of the cost of the house in nearly every instance.

In 16 parts, super-royal 8vo, 2*s.* each; also in 4 half-vols., cloth elegant, 10*s.* 6*d.*

The Works of Robert Burns.

Complete Illustrated Edition, Literary and Pictorial. Consisting of a Complete Collection of his Poems, Songs, and Correspondence; arranged Chronologically, and accompanied by numerous Notes and Annotations. The whole preceded by Professor WILSON'S Essay "On the Genius and Character of Burns," and Dr. CURRIE'S Memoir of the Poet; with a Series of magnificent Landscape and Portrait Illustrations.

"*This is unquestionably the most beautiful edition of the works of Robert Burns we have seen. The engravings are admirable, the typography very choice, and the notes select and useful.*"—Court Journal.

"*Both the plates and the notes contribute to give this edition the stamp of nationality.*"—Spectator.

"*The most elegant edition of Burns ever published.*"—Scotsman.

In two handsome vols., super-royal 8vo, 36*s.*; or 15 parts, 2*s.* each.

The Works of the Ettrick Shepherd,

IN POETRY AND PROSE. Centenary Edition. With a Biographical Memoir by the Rev. THOMAS THOMSON. Illustrated by Forty-four fine Engravings on steel, from Original Drawings by J. O. Hill, R.S.A., K. Halsewelle, A.R.S.A., W. Small, and J. Lawson.

Hogg's Works comprise *Tales in Prose*, illustrative of Border history and superstitions. They comprise likewise Poems of great imaginative power and descriptive beauty; Ballads full of humour and touches of tender pathos; and Songs which, besides being universally popular when first made public, are still cherished as among the finest productions of our native lyric muse.

"*Certainly we may now recognize him as the only one of Burns' followers who deserves to be named in the same breath.*" Press.

To be completed in 14 parts, medium 8vo, price 2*s.* each; or 4 divisions in stiff covers, cloth back, at 6*s.* each, and one at 4*s.*

Modern Steam Practice and Engineering:

A Guide to Approved Methods of Construction, and the Principles relating thereto, with Examples, Practical Rules, and Formulæ. By JOHN G. WINTON, Engineer, Author of "Modern Workshop Practice." Assisted by W. J. MILLAR, C.E., Secretary of the Institution of Engineers and Shipbuilders in Scotland; Author of "Principles of Mechanics," &c. Illustrated by numerous Engravings.

The object of the present publication is to supply the practical Engineer, Shipbuilder, and Mechanic with a trustworthy guide to the varied operations of the Workshop and the Building-yard in a convenient form and at a moderate price. It is written by practical men, well acquainted with the operations which they describe, and seeks to convey to the workman detailed directions regarding his work in language such as he is daily familiar with; and, at the same time, to state clearly the higher principles upon which these operations are based and on which they depend for success.

In 20 parts, super-royal 4to, 2*s.* each.

The Carpenter and Joiner's Assistant.

By JAMES NEWLANDS, Borough Engineer of Liverpool. *New and Improved Edition.* Being a Comprehensive Treatise on the selection, preparation, and strength of Materials, and the mechanical principles of Framing, with their applications in Carpentry, Joinery, and Hand Railing; also, a complete treatise on Lines; and an Illustrated Glossary of Terms used in Architecture and Building. Illustrated by above One Hundred Engraved Plates, containing above Nine Hundred Figures; and above Seven Hundred Geometric, Constructive, and Descriptive Figures interspersed throughout the text.

"We know of no treatise on Carpentry and Joinery which at all approaches this in merit. . . . We strongly urge our practical mechanics to obtain and study it."—Mechanic's Magazine.

Third Edition. Large 8vo (1000 pp.), cloth 16*s.*, or half morocco, 20*s.*

A Manual of Rules, Tables, and Data

FOR MECHANICAL ENGINEERS, based on the most recent investigations. By DANIEL KINNEAR CLARK, author of "Railway Machinery," &c. &c. Illustrated with numerous Diagrams.

This book comprises the leading rules and data, with numerous tables, of constant use in calculations and estimates relating to Practical Mechanics:—presented in a reliable, clear, and handy form, with an extent of range and completeness of detail that has not been attempted hitherto. This (the third) edition has been carefully revised, and in its preparation advantage has been taken of many suggestions made by those using the former editions.

"Mr. Clark writes with great clearness, and he has a great power of condensing and summarising facts, and he has thus been enabled to embody in his volume a collection of data relating to mechanical engineering, such as has certainly never before been brought together. We regard the book as one which no mechanical engineer in regular practice can afford to be without."—Engineering.

Foolscap 8vo, bound, 7*s.* 6*d.*

Peddie's Practical Measurer.

A Series of Tables for the use of Wood Merchants, Builders, Carpenters, Joiners, Sawyers, Plasterers, Painters, Glaziers, Masons, Bricklayers, &c. New edition, greatly enlarged.

To this edition have been added Tables for facilitating calculations of timber in Deals and Battens; and also for estimating the price of Boards of various thickness, and for other purposes. The Work now presents the most extensive and complete set of Tables of the kind that is in the market, and contains information only to be elsewhere obtained from several books.

Foolscap 8vo, bound, 9*s.*

The Agriculturist's Calculator.

A Series of Forty-five Tables for Land Measuring, Draining, Manuring, Planting, Weight of Hay and Cattle by Measurement, Building, &c. &c.

It is believed that scarcely anything can occur in Farm calculations for which these Tables do not provide valuable assistance; and that the care and labour bestowed on their compilation entitle them to the confidence of the agricultural community.

"I have looked over the tables in your Agriculturist's Calculator, *and, without hesitation, give it as my opinion that the Work will be of the greatest advantage to all connected with land. Every Proprietor, Factor and Farmer should have it."*—THOMAS BALMER, Commissioner for His Grace the Duke of Richmond.

New Issue, with Questions. Eleven vols., post 8vo, cloth, red edges, 3*s.* 6*d.* each.

Notes on the New Testament,

Explanatory and Practical. With *Questions* for Bible Classes and Sunday-schools. By ALBERT BARNES. Edited by the Rev. ROBERT FREW, D.D. With numerous additional Notes, and an extensive series of beautiful Engravings and Maps, not in any other edition.

Shortly before his decease the Author completed a revision of his Notes on the New Testament, to the end of the Acts of the Apostles, the only section of the New Testament respecting the exposition and illustration of which modern research had accumulated new and important materials.

In making this new issue the first three volumes have been re-set so as to embody the author's latest corrections and additions, and they are now presented for the first time to readers in this country. This issue will consequently be the most complete and perfect of any published in Great Britain.

Additional Notes have been supplied by the Editor, chiefly in the Epistles, giving an epitome of the general doctrinal opinions held in this country.

This issue of *Barnes' Notes* will be enriched and rendered more useful by the addition of the valuable series of *Questions* "designed for Bible-classes and Sunday-schools" prepared by the Author.

The Illustrative Engravings, which enable the reader to realize New Testament scenes in a vivid and attractive manner, consist of views of the chief places of interest referred to in the New Testament, derived from the most authentic sources.

In nine volumes, post 8vo, cloth, red edges, 4*s.* each.

Notes on the Old Testament.

BY ALBERT BARNES. Comprising the Books of Job, Psalms, Isaiah, and Daniel. Edited by the Rev. ROBERT FREW, D.D. With numerous additional Notes, and many illustrative Engravings not in any other Edition.

The editorial introduction to the Book of Job—the additions to the Notes on the Book of Psalms, from the most distinguished expositors at home and abroad, selected on the principle of more fully exhibiting the scope of the Psalms, or because of some special excellence in the extract—and the annotations on the books of Isaiah and Daniel, give a peculiar value to this Edition.

The Illustrations consist of 32 page Engravings and 3 folding Maps, besides 170 subjects printed in the text; and include some unusual but striking illustrations of passages of Holy Writ not usually deemed susceptible of pictorial illustration.

Royal 4to, cloth, 27*s.* 6*d.*; or in 25 parts at 1*s.* each.

Family Worship:

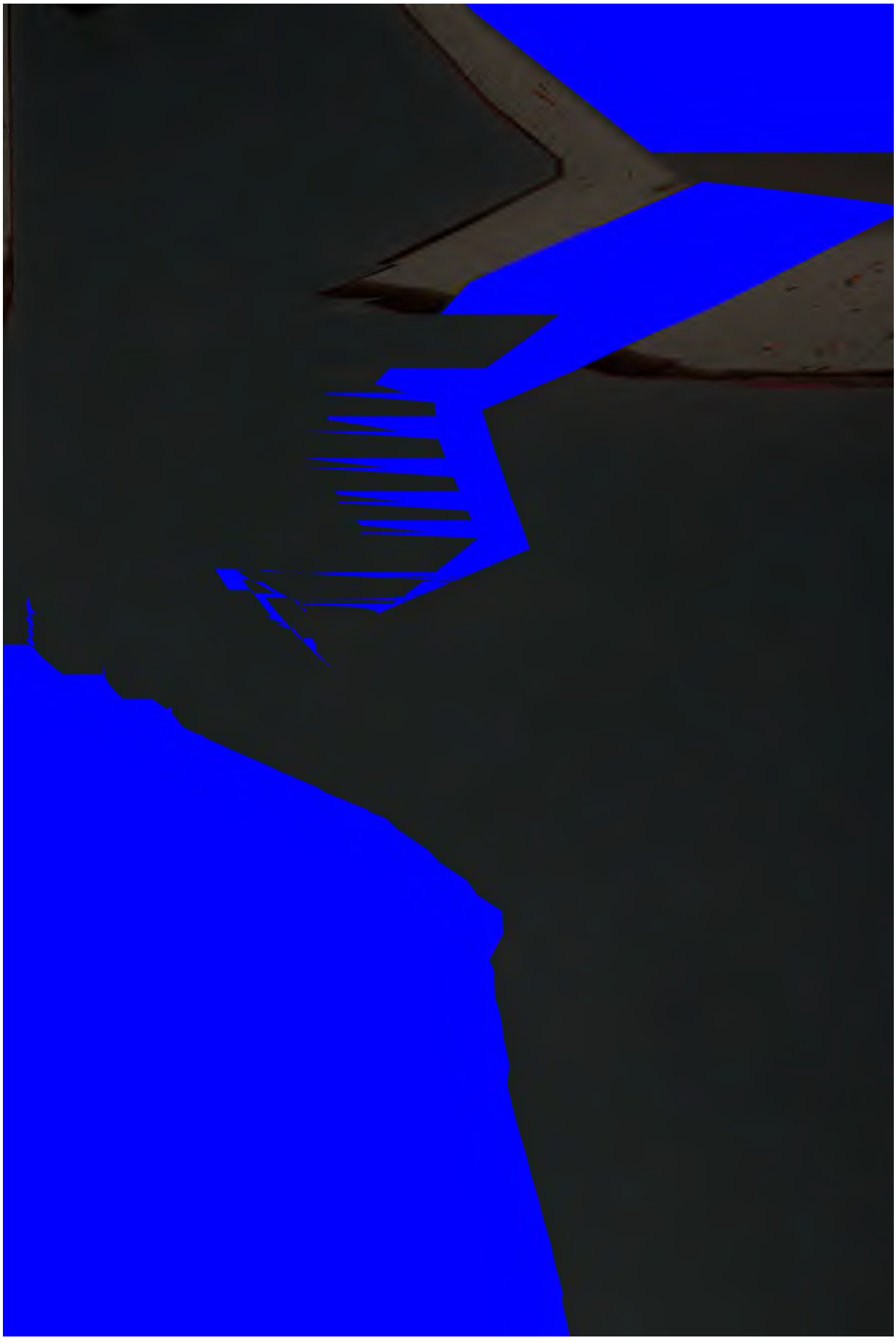
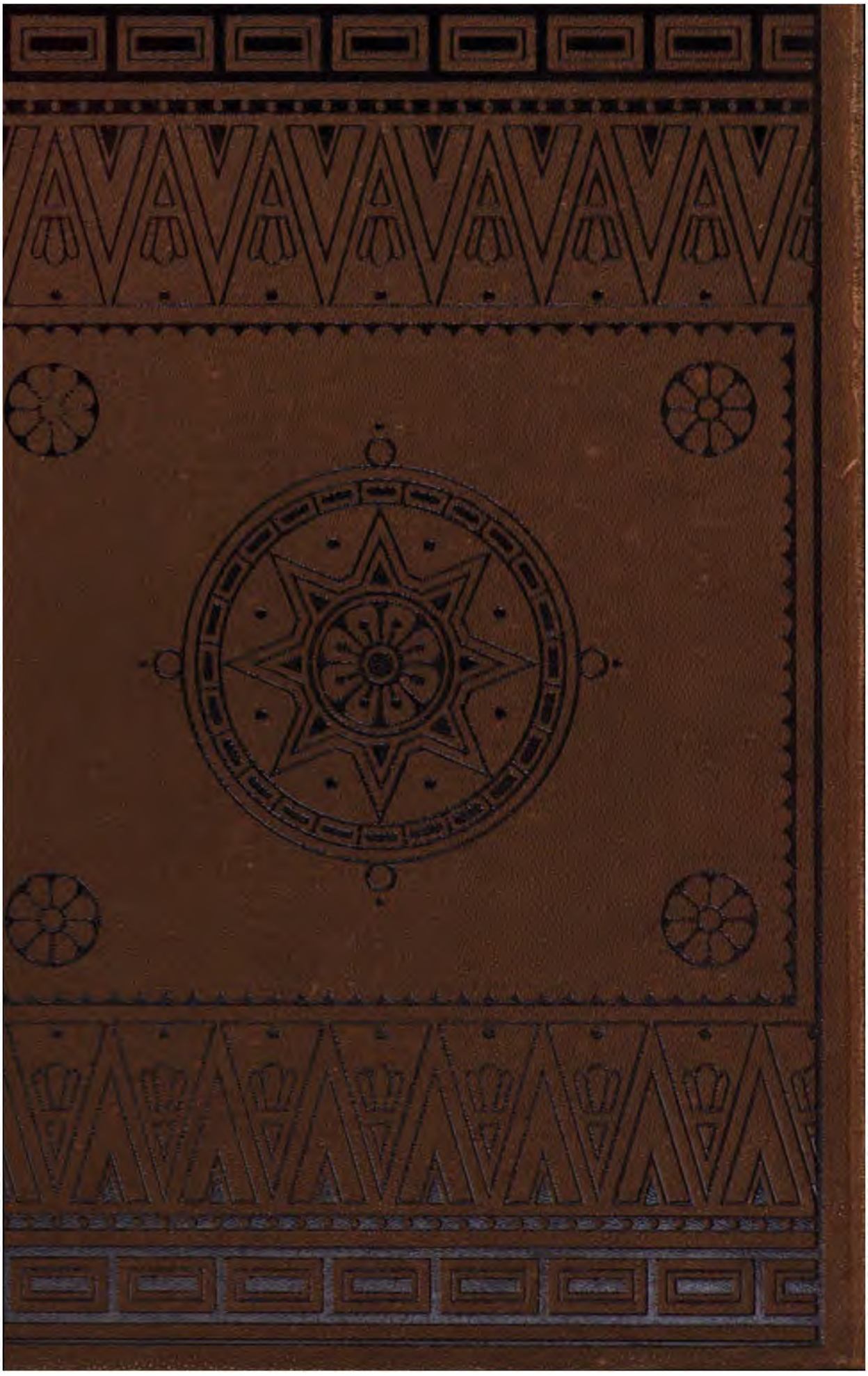
A Series of Devotional Services for every Morning and Evening throughout the Year, adapted to the purposes of Domestic Worship; Prayers for Particular Occasions, and Prayers suitable for Children, &c. By above TWO HUNDRED EVANGELICAL MINISTERS. Illustrated by Twenty-six fine Engravings on steel. New and Improved Edition.

The work comprises 732 Services, adapted to be used in the family, being a service for *every* MORNING *and* EVENING throughout the year, with Special Services for the Morning and Evening of New Year's-Day. Each Service is composed of Praise, Prayer, and Scriptural Exposition. Thus it points out a suitable psalm or hymn to be sung; next it refers to a portion of Scripture to be read from the Bible itself, and adds some brief explanatory and practical remarks; and the whole closes with a plain and earnest Prayer.

Complete in 16 parts, royal 4to, price 2*s.* each; forming a handsome volume.

The Life of our Lord and Saviour Jesus Christ,

And the Lives of the Apostles and Evangelists. By Rev. JOHN FLEETWOOD, D.D. With Copious Illustrative and Explanatory Notes selected from the Works of the most eminent modern writers on New Testament History. Profusely illustrated by Engravings.

The numerous editions of this work which have been published testify sufficiently to its acceptance with the Christian public. It evidently supplies a felt want by presenting in one consecutive history the several narratives of our Lord's life and sayings while on earth recorded by the four Evangelists.

LONDON: BLACKIE & SON, OLD BAILEY; GLASGOW & EDINBURGH.